IMPACT OF ENVIRONMENTAL POLLUTION ON SOCIO-ECONOMIC CONDITIONS OF INHABITANTS IN JAMSHEDPUR CITY

DISSERTATION

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Certificate

This is to certify that ***Ms. Shahina Tanweer*** has completed her M.Phil. Dissertation on ***"Impact of Environmental Pollution on Socio-economic Conditions of Inhabitants in Jamshedpur City"***, under my supervision. This dissertation is a partial fulfillment for the award of the degree of Master of Philosophy in Geography.

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Dedicated
to my parents

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INTRODUCTION

Pollution of the environment is one of the serious crisis to which we are facing today. It is fundamental facts that three basic elements air, water and land which constitute harmony of nature for proper and balance living of all organisms, it was fortunate enough that such hospitable and balance environment was the destiny of our predecessors. But it is contrary to living of the present environment. With the rapid growth of population, urbanization, industrialization, commercialization, consumerism, fast changing life style, unplanned development etc, have deteriorated the ecological balance day by day, and now it went beyond its sustainable limit. The craze of progress in agriculture, industry, transportation and technology is taken as the general criterion of development of any nation. Such activities of man has created adverse effects on all living organisms in the biosphere.

Rapid industrialization has left with us polluted rivers, contaminated soil, depleted wild life and exhausted natural resources. Today the environment has become foul contaminated, undesirable and therefore, harmful for the health of living organisms including man. The endowment of natural resources is our heritage that should never be spoiled. But unwisely and irrationally use have disturbed the delicate ecological balance. The root cause of environmental pollution has been the man's unwisely and irrationally use of nature that develops the undesirable situation for conducive living of all organisms in the environment. The undesirable situation has threatened the survival of not only man but also all the organism of the environment.

The increasing population and poverty are also the cause of environmental pollution which compel the people for over exploitation of natural resources of the region. Besides poverty, illiteracy, unawareness, lack of knowledge, irrational and unplanned development, etc, also contribute to environmental pollution at regional scale.

The term environment, as for as pollution is concerned, includes the air, the water, the soil, the landscapes, the oceans, the lakes, the rivers and many other ecosystem. The pollution is generally defined as the addition of

undesirable elements to water, air and land, which adversely affect the natural quality of the environment.

Today the environmental problems have become global concern. The environmental changes are perceived in the whole of the biosphere such as global warming, depletion of ozone layer, acid rains, burning of fossil fuels, air pollution, water pollution, soil pollution, noise pollution, agricultural pollution, social pollution and development of heat island etc. They are threatening very survival of living beings.

Scientists and some international organizations are well aware of these phenomenon and are trying to focusing their researches at top priority levels in different countries of the world. At international level many conventions were held right from Earth Summit, Monterial Protocall, Queto Summit, Tokyo, etc. regarding environmental problems. Environmentalist, intellectuals and governmental agencies were very much concerned regarding the problem of environment. They passed many agenda and measures to reduce the environmental pollution at global level. The eco of the summits went across the world and drew the attentions of the people to think and do the best possible works and research regarding how to manage our delicate environment and to adopt certain remedial measures to reduce the accentuated environmental pollution.

Today India which occupies 7^{th} place among the industrialized developing countries of the world is provided with a good industrial infrastructure in several industries like chemicals, power, nuclear energy, food petroleum, pesticides and plastics etc. A rapid progress in atomic and nuclear energy has added a huge amount of radioactive substances in the atmosphere. A number of industrial effluents and emissions especially toxic gases are spewed into the air daily, thus the environment is deteriorated to such an extent that it has crossed the critical limit and has become lethal to all organisms including man.

Study Area

The city of Jamshedpur has been selected as study area as it has clustering of industries mainly related to heavy engineering and mining generating a huge quantity of pollutants which affects the natural quality of air, water, land and house hold environment due to lack of proper

management and pragmatic policy to reduce the extent of air pollution and suitable sites for proper disposal of solid waste, the very environment of the city is being contaminated day by day that affects to the inhabitants at every walk of life. In view of this problems the present study is a humble attempt to highlight the nature and cause of air pollution as well as the improper management of solid waste generation.

Objectives

The objectives of the present study are as follows.

1. To analyse the sources and causes of air pollution in Jamshedpur city.
2. To examine the level of air pollution in spatio temporal context.
3. To examine the different types of solid waste generated from various sources and classify them according to their nature.
4. To identify the intensity zone of solid waste generation.
5. Finally to analyse the impact of air pollution and solid waste disposal on human health and also suggest a suitable measures in order reduce the impact of environmental pollution on habitats of the region.

Data Source and Methodology

The methodological principal adopted for the present analysis is based on qualitative and quantitative approach. The qualitative approach explains the emperical observation through field survey. The quantitative approach states the analysis of primary and secondary data collected from field survey and from various agencies, using simple statistical techniques. To present visual interpretation cartographic techniques has been used.

The present study is a modicum attempt of M.Phil work leading to Ph.D. has been organized into six chapters.

The first chapter deals with the concept and nature of environmental pollution.

The second chapter is concerned with the review of work done so far.

The third chapter discusses the geographical out look of the study area.

The fourth chapter is related with the air pollution- A spatio temporal analysis of Jamshedpur City.

The fifth chapter deals with the pollution of solid waste- A spatio temporal analysis of Jamshedpur City.

And the sixth chapter is the impact of environmental pollution on the habitats of Jamshedpur city.

CHAPTER-1

CONCEPT AND NATURE OF ENVIRONMENTAL POLLUTION

There had been a harmonious blend in nature. Man is a inseparable part of organic whole. The interaction between man and environment is not a new phenomenon but it is too old, that can be traced since the man appeared on the globe. Initially the relationship between man and environment was very harmonious cohesive and balanced. This relationship was going very smoothly and desirable. After the industrial revolution the multiple desire of the man, the need of the day- changing consumer behaviour population growth, urbanization, industrialization, commercializations, globalizations, development of means of transport and communications, tourism (esthetic sense), illiteracy backwardness poverty in all together are responsible to disturb the very nature of balance between man and environment and posing a serious threat to environmental degradations in the form of pollution of air, water, noise, solid waste and social environment. These forms of pollutions are adversely affecting the health and environment of the people that needs a invediate redressal measures to overcome these problems. Otherwise a major chunk of human resources and fruitful environment will reach to the brink of serious disastrous.

The word pollution derived from the Latin word pollution (meaning to defile or make dirty) is the act of polluting the environment. The terms pollution is defined in various ways. For example.

1. Pollution is the unfavourable alteration of our environment, largely because of human activities.
2. Pollution is the accumulation of matter in the wrong place or anything released into the environment which degrades its quality.
3. Pollution is an undesirable change in physical, chemical or biological characteristics of water, air and soil that may harmfully affect human, animal and the plant life, industrial progress, living conditions and cultural assets.

4. Pollution is the introduction of surplus energy or waste matter into the environment by man's activities which directly or indirectly cause hazard to man and his environment[1].

1.1 ORIGIN OF POLLUTION

There are different views regarding the origin of pollution crisis on the planet earth. According to Lynn White (1967) and Ian Mc Harg (1969), Judeo-Christian ethic is responsible for pollution, because ethic taught man to believe that the earth was made for man to do with it as he wished, and thereby encouraged exploitation.

According to Write (1970) human greed and ignorance have allowed our culture to develop an ecological crisis like pollution.

According to Southwick (1976), human population explosion is the main cause of pollution. He pointed out that with more people there is more sewage, more solid wastes, more fuel being burned and more fertilizers and insecticides being used to produces more food for hungry mouth.

Finally there have been certain modern ecologists like odum (1971), Southwick (1976), Smith (1977) etc who regarded many factors such as human population explosion, unplanned urbanization and deforestation, profit oriented capitalism and technological advancement which may be responsible for origin of pollution crisis on earth.

1.2 NATURE OF POLLUTIONS

Pollution is usually brought about by the addition of waste products of human activity to the environment. When the waste products are not efficiently assimilated, decomposed, or otherwise removed by the natural, biological and physical processes of the biosphere, adverse effects may result as the pollutants accumulate or get converted into more toxic substances. Thus the materials which cause pollution of environment are called pollutants.

Pollutants can be classified in a number of ways for example (a) on the basis of their forms they exist in the environment after their release. On this basis pollutants can be classified as:

1. **Primary Pollutants-** Those substances emitted directly from an identifiable source. These pollutants exist as such after being added or released into the environment. Example are sulphur dioxide, nitrogen oxides etc.

2. **Secondary Pollutants-** These are substances, derived from primary pollutants by chemical reactions. For example, primary pollutants such as hydrocarbons and nitrogen oxides, particularly in the environment react in presence of sunlight to form of group of nitrous compounds like peroxyacetyl nitrate (PAN) as the secondary pollutant

(b) From ecosystem point of view, the pollutants may be classified as biodegradable and non-biodegradable pollutant.

1. **Biodegradable Pollutants-** Biodegradable pollutants are those which can be decomposed easily in their natural environment, that is, by the natural biological process and also in the engineered systems which enhance nature's great capacity to decompose and recycle. Such pollutants consist of animal and plant debris, domestic sewage etc, which on decomposition give out nutrients like carbonates, phosphates, etc. that are released in the biosphere.

2. **Non-biodegradable Pollutants-** Non-biodegradable pollutants are those which either do not degrade or degrade very slowly in their natural environment. Such as pollutants are mostly inorganic compounds like mercury and lead salts, aluminium cans, iron, compounds like phenolic compounds and D.D.T. etc. such pollutants are harmful even in low concentration. These pollutants not only accumulate, but are often biologically magnified as they move in biochemical cycles and along food chains. They may also react with other compounds present in the environment to produce even more toxic additional products[2].

The environment damaging properties of pollutants are the function of short and long term toxicity, persistence, dispersal rats, chemical reactions and breakdown of products, tendency to bioaccumulation and rate

of control. Persistent substances of high toxicity in nature are difficult to control and are hence more troublesome.

1.3 AIR POLLUTION

Air pollution refers to those conditions in which the general atmosphere contains substances in concentrations which are harmful to man or his environment or which interfere directly with mans comfort, safety or health (Parkins 1974)[3].

Air pollution may be defined as the disequilibrium condition of the air caused due to introduction of foreign elements from natural as well as anthropogenic sources to the air so that the air becomes injurious to biological communities in general and human community in particular.

Technological advancement, industrial expansion, population explosion, urbanization and man's constant striving for higher standard of living as measured in terms of the number and values of his material possessions have all contributed to the creation of air pollution.

Sources of Air Pollution

On the basis of physico-chemical properties the air pollutants have been divided mainly into two major groups, particulate and gaseous matter. Further particulate has been divided into two sub groups fine particles which include carbon particles, metallic dust, tars, resins, aerosols, solid oxides, nitrates and sulphates. Coarser particles are larger particles and heavy dust which are quickly settled by gravitational force. Whereas compound of sulphur, nitrogen and oxygens are well as halogens and radioactive substances are considered as gaseous pollutants.

The major agents of air pollutions are discussed in sequential order.

1. **Automobiles-** Automobiles have been regarded the greatest source of air pollution. They produce nearly two third of the carbon mono-oxide and one half of the hydrocarbon and nitrous oxides. The automobiles exhaust has also leaded gas and particulate lead.

Transportation, industry exclusive of automobiles and including rail roads ships, air crafts, trucks and buses, tractors etc have been contributing the same type of pollutants as cars.

It contributes pollution in the air especially in metropolitan areas. Mobile source includes road vehicles, aircrafts, ships, railways and other combustion engines. Vehicles emissions in India have become the most significant and critical air pollutants because of the unprecedented increase in vehicular population in urban areas. In 2000 there were about 500.00 Lakhs total number of vehicles in India. The number of vehicles in Jamshedpur city has increased phenomenally from 16607 in (2001-2002), 20930 in 2002-2003 and in 2003-2004 it reached to 25480.

The national highway NH-33 pass through the city. The density of traffic on the highway is very high. In addition the heavy traffic density results into emission and generation of huge amount of particulates- SO_2, No and CO etc.

2. **Industries-** Industrial process like metallurgical plants and smelters, chemical plants, petroleum refineries, pulp and paper mills, sugar mills, cotton mills and synthetic rubber manufacturing plants have been responsible for about on fifth of air pollution.

Some of the major industries in the city like the Tata Iron and Steel Company, The Tinplate Company, The Tube Division, The Cumins, Tata Pigments, Jamipol, Tata Robin Fraser etc are the main sources of air pollution. The different types of emissions from the chimneys and towers of the different units of the steel plant bring the invisible atmosphere into the well distinct visible layer hanging over the steel plant with periodical multicoloured painting.

In Jamshedpur steel plant the pollutants in general are dust particles such as CO, SO_2, NH_3, H_2S, HCN, NO, noxious gases, fumes, anthracene vapours, mercury from instruments, heat radiation etc.

3. Fuel Combustion- It include mainly SO_2, NO_X, particulates, acids and aldehydes, CO, a toxic contaminant is also emitted from combustion. Complete combustion yields only CO_2 and not CO. Of all the fuels, those used in stationary combustion and natural gas are reported to be the best as they contain traces of sulphur and less particulate emission.

Major types and concentration of air pollution

There are different types of air pollutants. Only the major types can be discussed in detail. The single most common is of course, Nitrogen with 78 percent. The most common pollutants such as carbon mono-oxide, ozone, nitrogen oxide and sulphur-dioxide are present in minute concentration in a natural atmosphere.

1. **Oxides of sulphur (SO_X)-** Sulphure is an impurity in coal and in fuel oil. Through combustion it enters the atmosphere as sulphur-dioxide, hydrogen sulphide, sulphurous and sulphuric acid and various sulphates. The whole world emits about 80 million tons of oxides of sulpher (SO_X) into the atmosphere annually which is more than twice the world sulphur production of about 30 million tons.

2. **Carbon Mono-oxide (CO) and Carbon dioxide (CO_2)-** Carbon mono-oxide is a colourless, odourless and lethal gas, results from incomplete combustion of carbonaceous materials of the worlds total carbon mono oxide production of 232 millon tons, 80 percent is produced by automobile. If this amount were evenly spared over the lower atmosphere it would increase the carbon mono-oxide content by 0.03 ppm per year. This is very significant because carbon mono-oxide is a very stable gas. Carbon-dioxide is heavy colorless and odorless gas is generally not considered an air pollutants, because it is essential in all life process. Increased carbon-dioxide level produced so called green house effect, which rises the temperature in cities. Since the industrial revolution some 330 billion tons of carbon dioxide from combustion process have been added to the atmosphere. This amount to about 14 percent of the natural carbon dioxide content in the air.

3. **Hydro carbons (HC)-** Hydro carbons originate from the combustion of gasoline, coal oil, natural gas and wood from operation of gasoline and industrial solvents made from natural sources mainly the decomposition of the vegetation. Man made hydrocarbon emissions amount to 90 million tons in year, where as flooded swamps produce hydrocarbon at a rate of 1.6 million tons a year.

4. **Oxides of Nitrogen (NO_X)-** Nitric oxide (NO_X) a relatively harmless gas, turns into a pungent, yellow, brown harmful gas when oxidized to nitrogen dioxide. Man made nitrogen dioxide originates from stationary sources, such as fertilizers and explosive industries and from mobile sources, such as automobiles, trucks, and buses. The major natural sources for oxides of nitrogen compounds are organic decomposition in the soil and perhaps in the ocean.

5. **Particulate Matter-** It consist of solid and liquid particles of a wide range of sizes varying from greater than 100 μg to less than 0.1 μg. Particles larger than 1010 μg consist mainly of dust, coarse dirt and fly ash from industrial and erosive processes. These large particles usually settle out rapidly. Particles below 10 μg remain much larger as suspended matter in the air. Particulates below 5 μg as known as smoke and fume these under 1 μg as aerosols. The life of particles in the troposphere lasts only a few days. If they are however, injected in to the stratosphere, they may however around the globe for several years. This may have a severe impact on globe climate[4].

1.4 WATER POLLUTION

Water is not only a resource of economic value but also a basic component of man's natural environment. At present water problem is becoming increasingly acute mostly due to the deterioration of the quality of surface and ground waters and their progressive pollution. A good deal of effort is being made to prevent this evil but its efficacy is so far inadequate.

The term water pollution is referred to the addition to water of an excess of material (or heat) that is harmful to humans, animals or desirable aquatic life or otherwise causes significant departures from the normal activities of various living communities in or near bodies of water.

In general water pollution may be defined as a adverse change in composition or condition of water such that it becomes less suitable for the purposes for which it would be suitable in its natural state. The changes include physical changes chemical changes and biological changes.

Water gets contaminated due to physical, chemical and biological pollutants. The physical pollution bring changes in the water in regard to its

colour, odour taste and the differences which create special problems for the water authorities, odour and taste is due to chemical and biological pollutants. Another form of pollution which is becoming widespread especially developed countries is due to micro contaminants of organic and radioactive nature.

Water pollution is frequently undesirable it causes disease transmission through infection, it may poison human and animals; it may create objectionable odours and unsightliness; it may be the cause of the unsatisfactory quality even of treated water, it may affect economic activities like shellfish culture. The causes and forms of water pollution created by humans are many and can be classified into groups as follows:

1. Sewage and other oxygen demanding wastes.
2. Infectious agents.
3. Organic chemicals
4. Other chemical and mineral substances.
5. Sediments (turbidity)
6. Radioactive substances and
7. Heat (thermal pollution).

Moreover, many human activities can contribute to change in water quality, including, agriculture, fire, urbanization, industry, mining, irrigation and many other, of these it is probably agriculture that is most important. Some pollutants merely have local effects, while others such as acid rain or DDT may have continental or even planetary implications.

It is not a simple matter to recognize trends in pollution. In general long term records are sparse, gauging stations are often moved, analytical methods change, and some trends in water chemistry may be due to factors (including climatic change) rather than to people. However, where long term data are available some of the changes in water chemistry are striking[5].

STATUS OF WATER POLLUTION

Ground water, rivers, seas, lakes, ponds and streams are finding more and more difficult to escape from pollution. Many rivers of the world

receive heavy flux of sewage, industrial effluents, domestic and agricultural wastes which consist of substances varying from simple nutrient to highly toxic hazardous, chemicals. In India all the major 14 rivers e.g. Ganga, Yamuna, Godavari, Gomti, Kosi, Cauvery, Ravi, Sone, Chenab, Jhelum, Narmada, Mahi, Tapti and Krishna are facing acute pollution problems.

In Jamshedpur there are mainly two sources of water i.e. Subarnarekha river and Dimna Lake. Most of the units are being run on close circuit water system. The river water is very much polluted, and full of bacteria and virus, the turbidity is also very high. Quality of Dimna water is far better than the Subarnarekha river. Tisco controlled area get piped fresh drinking water from Dimna reservoir. In Jugsalai and Mango the supply is very poor.

Tata steel has taken various steps for optimum use of water and reduction of pollutants discharged in water bodies from the steel plant. The increased stress on water circulation in all the processes has contributed to considerable reduction in specific water consumption. Specific water consumption including power generation has been reduced by more than 10% over the last year. Close monitoring of water losses recycling of ash quenching water from power house # 3 and recycle of waste water from various drains have resulted in such reduction.

Waste water from processes is being treated with best available physico-chemical methods and recycle in the process. Waste water from coke plant is treated biologically where organic pollutants are oxidized and decomposed by micro organisms. Consumption of water ($7.36 m^3$/tss) in 2001-2002 is much lower than the legal norms of 20 m^3/tss. Total water pollutant discharge was 0.186 kg/tcs against the target of 0.19 kg/tcs. The levels of total pollutant discharge in the waste water streams have reduced considerably over a period of time. The pollutants include, suspended solids, ammonia, cyanide, oil and grease etc. Waste water in different drains from steel works is regularly monitored, particularly for critical parameters depending upon the shops attached to the drains. All the pollutants including pH, suspended solids, oil and grease, ammonia, cyanide, BOD and COD in all the drains were found within permissible limits.

Tata steel regularly monitors up-stream and down stream of rivers namely Subarnarekha and Kharkai which forms life line of Jamshedpur city.

SOURCES OF WATER POLLUTION

Pollution due to domestic and municipal wastes

In India only the urban population which, constitutes approximately 20 percent of the overall population of 700 million or 1 billion has facilities of domestic waste disposal and treatment to some extent of these at present, only 15 class 1 cities (above 0.1 million) out of that 142 are fully sewered, while this facility exist in only 7 of the 190 class 2 cities (0.5-0.1 million). Moreover, 55 class 1 cities and 35 class 2 towns have Partial Sewerage. Partial treatment is available in 27 class 1 cities and 12 class 2 towns. Only 8 class 1 cities and 3 class 2 towns have full sewerage and full treatment facilities. Where as 72 class 1 cities and 147 class 2 towns have neither sewer nor treatment facilities. The rural population, which is about 5 times the urban population, is provided with negligible environmental sanitation. Such gross inadequacy in sewerage treatment systems in major human settlements is the principal cause of water pollution in India. Although sewerage system is in adequate in class 2 towns but it is comparatively lower than class 1 cities.[6]

Water Pollution due to Industrial sources

There are about 2700 large and medium industries out of which 1700 units, contributes significantly to pollution. Already, 353 large and medium industries are operating industrial wastewater treatment plants, 174 industrial effluent treatment plants are under construction & 190 units are in the planning stage, thus covering 717 industrial units out of 1700 large and medium industries.[7]

On the other hand large and medium industrial units contribute 70 percent by volume of the total industrial wastes. The remaining 30 percent is contributed by the small and cottage sector units. Any success in controlling 70 per cent by volume of the total industrial wastes would, however mean only 7-10 percent of the total volume of the waste water generated in the industrial cities of India. It is estimated as constituting 8-16

percent of the total city waste. With the present rate of industrialization, it is expected that by 2025 AD this percentage would rise to well above 50.

Pollution due to agriculture

Fertilizers, pesticides, insecticides, herbicides, processing wastes and animal wastes etc are constantly added to water. Leachates from agricultural land containing nitrates, phosphates and potash, move downward with percolating water and join the aquifers below posing danger to the ground water.

SOCIAL AND OTHER PROBLEMS CAUSED BY WATER POLLUTION

The inadequate sewage treatment combined with inadequate treatment of raw water cause a perpetual recycling of pathogenic organisms into user population. Apart from causing epidemics and acute health problems, this situation also leads to a chronic gastroenteritis illness symptom in very large number of individual. Millions of man-hours estimated to be lost due to these debilitating diseases. With the increasing public consciousness towards hazards of pollution there have been several concerted and successful public protest in recent years, especially against industrial waste discharge.

1.5 NOISE POLLUTION

The 20th century has been described as the century of noise. Noise has become a very important stress factor in the environment of man. The term noise pollution has been recently coined to signify the vast cacophony of sounds that are being produced in the modern life, leading to health hazards.[8]

That which we hear is called sound, and unwanted sound is noise. The noise is an undesirable by product of the modern technological advancement, industrialization and above all the population boom specially the urban population. There will be hardly any exaggeration if the present day civilization is called a noisy civilization.[9]

Noise may be defined as sound without value or any noise that is undesired by the recipient perhaps a better definition of noise is wrong

sound in the wrong place, at the wrong time. The word noise is derived from the Latin word nausea.

The noise pollution may be defined as unwanted, unpleasent or disagreeable sound that causes discomfort.

Noise is an unwanted sound with a random intensity a signal that bears no information. The pollution by noise which is the product of modern age has increased in multifarious directions with the development of science, technology and high speed means of transport.

Sound is measured by several complex systems, but the best known unit of measurement is the decibel (dB) unit. The decibel measures a sounds intensity or to the ear, its loudness. The decibel is a tenth of the largest unit the bet, one decibel is equivalent to the faintest sound that can be heard by the human ear.

Human ear is known to be sensitive to an extremely wide range intensity from 0-180dB. Dropping of a pin on the floor produces about two decibels of sound. A marriage procession on an average produces about 80 dB of noise. Diwali crackers are much as 120 dB. A public meeting causes any where between 72 and 82 dB as shown by various studies.

SOURCES OF NOISE POLLUTION

The sources of noise pollution can be divided into two categories.

1. **Industrial Sources-** In industries noise is a byproduct of energy conversion. Cotton mills, laundries and many other industries where big machines are working at a high speed have noise pollution. In Industries, such as heavy engineering textile mills, bottlering industry etc the noise level is as high as 110-115dBA. A jet plane produce around 130-140 dBA. Apart from this there are numerous sources including automobiles that produce varying noise levels. [10]

So every industry produces noise pollution which requires our urgent attention in this direction.

2. Non industrial sources- Non industrial noise pollution sources can further be divided into following categories.

(a) Loud speakers

Loud speakers are used on many occasions continuously for hours together with their loudest capacity. Frequent use of loud speakers by temples, mosques, churches gurudwaras and other places of worship create disturbance to the students during examination periods due to noise pollution.

(b) Automobiles

Automobiles contribute towards noise pollution because no regulation is observed in blowing of horns and use of defective silencer pipes. Undesirable noise produced by their vehicles cause people annoyed.

(c) Trains

In India steam engines are commonly used by railways which produce a lot of noise. The impact of noise pollution by trains is maximum in those areas where railway tracks are situated in residential areas. With the introduction of fast trains the noise pollution has substantially increased.

(d) Air Crafts

The higher is the speed of an air crafts the greater is the noise pollution. The supersonic aircraft have added more noise for the flight of persons who live near aerodromes.

(e) Construction Work

Demolition and construction of urban renewal and expansions always make the urban man a victim of noise pollution. During demolition of old sites and construction of new buildings huge machines which produce a lot of noise are being commissioned and it has become a common scene in every big city where construction work is in progress. These noise might be created for social needs" such as construction but can be hazardous to a common man.

(f) Projection of satellites in space

A few source of noise pollution is satellite, are projected into space with the aid of high explosive rockets. Application and use of these rockets produce deafening noise at the time of lifting off a satellite, tonnes of TNT

and other explosives are used in these operations which creates noise pollution as well as air pollution.

(g) Radio Microphones

Radio and microphones can cause noise pollution if they are switched on with high volume causes noise pollution.[11]

1.6 Solid Waste (Land Pollution)

The land pollution is mainly caused by solid wastes and chemicals. Modern industrial development with simultaneous urbanization, has created a serious problem of solid waste disposal from cities, which on the hand is closely linked with the problem of sanitation and sewerage in the urban areas. Most cities of the world generate more solid waste than they can dispose off. In low and middle income countries municipal services for waste disposal cannot collect much of the solid wastes successfully, through the municipal waste disposal services often consume between a fifth to a half of the city budget. Uncollected refused dumped in public areas are ultimately drained into the water-ways that flow nearby and contribute to the spread of diseases.[12]

Incomplete and improper disposal of solid waste is a major urban problem today. With the unplanned development, urbanization, commercialization, changing consumer behaviour together with industrial and domestic waste, have created severe urban problem. The management of solid waste is an obligatory duty of municipal bodies. The inefficient services, inadequate infrastructure facilities and unscientific selection of sites for disposal have further aggravated the environmental and health problems of the city. The daily per capita generation of solid waste ranges from about 100 gram/capita/day in small towns to 500 gram/capita/day in large town (CPCB 2000).

Solid wastes substances refer to a discarded material in a solid form that result from man's activities which on its immediate production is of no use to them. It may later be brought back to use when it is recycled reclaimed as reused. Wastes in urban areas arise from residential, commercial and institutional sources such as hospitals, educational institutions etc, besides construction debris left in a haphazard manner on

the roads. Residential wastes are generally products arising from food preparation, sweeping fuel residues, containers, packages, glass and vegetable and garden waste etc. Commercial waste are generated from shops offices, restaurants, warehouses and hotels. They range from vegetable waste in markets to packing material, fibre board, wooden and paper board, crates, paper, carbon etc. Industrial waste arise from manufacturing processes to include packing material, metal. Plastic, textiles chemicals, sludge etc. Hospital wastes are more dangerous and include street sweeping of dirt and litter, sewage, bandages, limbs, bottles, syringes etc. Construction debris largely consists of heaps of sand, stone and rubble on roads, street and vacant plots. The debris is a source of hindrance to riders on roads, besides producing an ugly site in visual pollution.[13]

1.7 PROBLEMS OF ENVIRONMENTAL POLLUTION

After foregoing discussions regarding the nature, sources and causes of environmental pollution in general and particular may be summarized as their impact on the health of people in a holistic manner. The basic problems regarding the impact of air pollution are the effects of respiratory system, bronchitis, emphysema, asthma and lung cancer is some of the chronic diseases caused due to exposure to polluted air. Sulfur dioxide is also considered to cause cough, shortness of breath, spasm of the larynx, acute irritation to the membrances of the eye. Whereas water pollution creates several detrimental health hazard all over the world. Water pollution causes communicable diseases like typhoid, cholera, hepatitis, gastroenteritis and diarrhoea etc.

The most notable effect of noise pollution is hearing. Violent noise can cause temporary or permanent impairment of hearing, thus a cause of deafness. Noise causes several undesirable effects also. Damage of hearing and loss of sleep are only two of the obvious results. It has its impact on blood pressure and is a cause of other cardiovascular diseases. The rate of heart beat may be affected by noise. Eosinophilia, hyperglycemia, and hypoglycemia are also caused by a change in blood and other body fluids due to noise. Noise also causes headaches and irritability.

The dumping of domestic and municipal waste is a serious problem in cities because of its impact on environment and public health. The decomposition of the various types of waste material causes harmful gases and bad smell, which not only pollute the environment but it is also harmful if mixed with chemicals. The municipal and domestic waste are often discharged in water bodies, thus responsible for water pollution. Industrial wastes are mainly discharged from coal, mineral mining and industries. These contain toxic metals such as lead, copper and chemicals having acids and are responsible for soil pollution. Diseases such as dysentery, diarrhoea, plague, malaria and numerous others are the result of the indiscriminate dumping of waste.

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CHAPTER-2

LITERATURE REVIEW

2.1 WORK REVIEW DONE SO FAR

A review of literature involves only those studies, which are concern with the variables of the present study. In this chapter the total volume of literature collected has been divided into subgroups dealing with different aspects of pollution viz, air, water solid waste and noise etc.

In 1968 Dasmann blamed the industrial society along with automobiles for the source of air pollution in urban areas. He identified sulfurdioxide as main pollutant for smoke formation, whereas carbon monoxide is very toxic, causes eye irritation.[1]

Rigg 1968 has discussed about the urban as well as rural environment and consider the biota in the present world. The air pollutants were classified into grit, dust, smoke and gas. Rigg stressed on improving the air quality by collecting samples from different areas. He studied about the major pollutants presnet in the air and also suggested to control of pollutants[2].

Bhide et al. 1972, rightly point out that refuse disposal is a persistant problem in the city of Calcutta. The authors have identified that due to increase in population density in the city the quantity of refuse is increasing further beyond the capacity of the disposal sites[3].

Berry and Brain 1974 identified the different types of air pollutants like arsenic and its compounds lead asbestos mercury, sulphur and nitrogen oxides, hydrocarbons etc. The main sources of pollutants are listed as industrial units, motor vehicles, combustion of fossil fuels etc. According to authors concentration of pollutants are highest in urban areas because of heavy industries and automobiles. Stress has been laid on use of alternative fuel for proper management and control of pollution[4].

Again Berry et al. 1974, have published a report on the study of relationship between urban form and quality of environment which was sponsored by Environmental pollution Agency (EPA), ten from among the

total array of air pollutants are selected as being of special causes because of their adverse health effect and toxicity. The present report shows that air pollution is found to be more intense in urban areas than the rural areas and the intensity increases with increase in city size[5].

Agarwal and Ghosh 1974 monitored levels of air pollution in various parts of Kanpur City and correlated levels of air pollutants with incidence of respiratory diseases. This study opened a new direction to scientists including geographers for further researches[6].

Wolanski 1980 studied very uncommon factor odours which causes hazard to human health. It is essential to protect the human environment from odours[7].

Bannerji 1981 has examined the environmental problems due to mining activities and has also suggested measures for planned reconstruction of mining, checking pollution, providing healthy human habitat and reclaiming degraded areas[8].

The National Environment Engineering Research Institute (NEERI, India) conducted a study in 1983 and published a report on the air quality of the different selected cities in India. The city of Calcutta has been divided into different functional zones and the air quality of those has been studied in different seasons viz winter, summer and monsoon. The main pollutants are SPM, SO_2, CO_2, NO_X and hydrocarbons. The concentration of pollution is found to be less in the residential zones than the commercial zones, and it is found to increase in winter. The report gives a good idea about the spatial as well as temporal variation of pollutants in the city[9].

Saha 1987 has dealt with the evidences on the incidence of air pollution in Calcutta and other industrial regions of west Bengal. The ambient air quality levels in Calcutta can said to be simply alarming and the pollution levels at streets are even higher because of greater influence of vehicular emission and ground blown dust[10].

Bose and D.N.K 1987 conducted a detail study of the environmental crisis in Calcutta metropolitan city. In the present context of the dynamic nature of the city an attempt has been made to highlight its ills and miseries

for improving the qualities of life of the people living in the city with the present hazardous environment[11].

Bordoloi 1987 propose to present an analysis of the factors which have caused degradation in tribal environment and the necessities for environmental planning in tribal area. Author has also proposed to deal with the applicability of science and technology for environmental planning in the tribal area[12].

In 1987 Goyal studied air and water pollution. He noticed that in India industrial activities and vehicles are the major source of air pollution, mainly by various poisonous gases e.g. carbon monoxide, hydrocarbons, oxides of nitrogen, sulphur dioxide, lead and suspended particulate matter. The most serious destruction of water quality comes from dredging spoils, municipal wastes and industrial wastes[13].

Ghosh 1988 gives the zonal variation of air pollution in Calcutta and the daily total emission of different pollutants in the city. The author suggests that the mechanism of pollution control ideally should have emission inventory and air pollution sampling network[14].

Chandra 1988 studied that air pollution has an adverse effect upon the health of human beings as well as ecology. Apart from the present problem also aims to analyse the concerning legislation which may appear to reveal the effect of air pollution to exercising the control over its causes and sources[15].

Sinha 1988 has worked on the study of the Damodar, one of the most polluted rivers of India. The polluted plight of the river is enhanced with passing time due to continuous and uncontrolled discharges of toxic and hazardous effluents. The author says that apart from the agricultural, industrial run-off, the domestic wastes from thick population of this belt simply increases the pollution[16].

Mohan 1988 conducted the study on noise pollution one of the major factors which creates environmental pollution. A perfect strategy is required to safeguard the city residents from noise pollution[17].

Bhandari 1989 studied that the industrial waste in the form of gases, liquids or solids when discharged to landsurface, water bodies or air causes

serious environmental changes often deteriorating the quality of land water and air. The author suggest that all industries should have an effluent treatment and control system set by Central Pollution Control Board (CPCB) in order to control the pollution[18].

Bhandari and Palria 1989 worked on the study of problem of industrial pollution of Jodhpur city, Industries are the principal source of waste, both in terms of quantity and toxicity. With the growing problem of city population, the industrial hazards waste is posing ever increasing problems to the town dwellers of Jodhpur[19].

Salita and Lasaca 1989, in their research paper studied about the environmental problems of Metro Manila air, water and land pollution. The deteriorating ecological conditions in the metropolis can be stemmed by adopting solutions and integrative planning and implementation.[20]

Ghosh and Sharma 1989 have examined the industrial pollution along Mokamah Barauni. Pollution of river Ganga is mostly caused by sewage, sullage and town refuse, mixed with some industrial and agricultural run-off involving physico-chemical and bacterial contaminantion. An attempt has been made to study about their effects and suggests that every industry should have effluent treatment facilities.[21]

De and Bose 1989 has given a detailed account of problems of ever increasing population, imperfect drainage, slums, insufficient water supply with its sanitary and structural defects and so on of Calcutta city. The present study is an attempt for improving the quality of life of the people living in hazardous environment of the city [22].

Reddy 1989 put emphasis on impact of urbanization on environment of Indian cities. The present article analyses the dimensions of deteriorating cities environment in terms of three main components of environmental pollution air, water and noise at metropolitan and large cities level[23].

Romleu and others (1991), conducted an intensive air quality survey in 32 countries of Latin American and Carribbean regions and found increasingly high levels of SO_2, NO_2, O_3 and TSP therein. The concentration of these pollutants were recorded extremely high in cities of Mexico and Brazil[24].

M. Shafi 1991 has correlated environmental pollution and global environmental change. It will be seen that development is related to environment. Today's environment is under great stress and it is largely because of mans own making[25].

Sinha 1991 has classified various human activities that causes water pollution. Human activities relate with water pollution comprise various industries such as mining and agriculture. Unsanitary water and malnutrition account for most of the illness and health. The increasing concentration of the population has invited the concentration of pollution sources[26].

Chandrasekharan & Ram Kumar 1991, describes the hazards and degradation of air, water and soil properties and quality that have been affected by limestone mining in and around Ariyalur. The ecological imbalance are also threatening the inhabitants[27].

Singh 1993 has made an attempt to analyse the spatial pattern of air pollution in Varanasi city. It is concluded that as the number of motor vehicles will increase in the city the amount of gases emit from them will also increase owing to increase in traffic density per hour at congested crossing of the city. It is ultimately bound to affect the human health adversely[28].

Mielke 1994 has contributed on the study of the automobile as a toxic substance delivery system. The automobile played a major role in delivery of lead globally and especially into local population centres. The most seriously contaminated places are major cities. Although lead has been removed from most fuels, other toxic substances emitted from the automobile need field investigation[29].

Swanson and Schubel 1994 have made an attempt to study of the effects of dumping unprocessed, shredded and baled garbage in the ocean. Various optimistic approach have also been adopted to minimize the waste[30].

Bhargava 1994 in his study of air pollution in Kota Rajisthan has made to deal with industrial, domestic, vehicular and some extent garbage disposal and incineration as the sources of air pollution[31].

Crapaz 1995 in his article entitled "*Explaining national variation of air pollution level*, Political institutions and their impact on environmental policy making"- studied that there is a systematic variation in air pollution levels across different countries. This study explains cross national variation in air pollution levels as a function of institutional factors. The hypothesis put forward is that the type of interest representation systematically affects air pollution levels[32].

Rossi et al. 1995 wrote the findings of a continuous monitoring (Apr 90, Mar 94) on urban air quality of a Po valley town. Chemical-physical and genotoxicity data were detected. The results show the presence of mutagenic agents during the whole investigation period. Short term mutagensis tests together with chemical-physical parameters analysis are able to better assess air quality and genotoxic risk for the pollution[33].

Verzinin et al. 1995 made an attempt to study about an interdisciplinary study of urban noise·pollution. Interdisciplinary research in two stages was carried out in Coroloba, Argentina, in four zones with different urban noise characteristics[34].

Bhargava 1995 studied that noise pollution is a major environmental hazard. It can cause occupational nuisance and work zone problems and can lead to severe health hazards. Mini steel plants and large scale steel plants in India have began to give serious consideration to the problem of noise pollution by adhering to the guidelines for pollution control as envisaged by the environmental protection act 1986 and other environmental regulatory standards for noise[35].

Doughlas et al. 1995, have developed a mathematical model and described basic transport and biological processes for biofilter. The model described transfer between air and solid-water phases of biological degradation of the substrate CO_2 production and accumulation[36].

Makela 1995 conducted a detail study on traffic emission in Russia and Baltic states. This paper presents the results of a recently completed study calculating the exhaust gas emissions of traffic in some parts of Russsia and Baltic State. The study dealt with seven compounds CO, HC, NOX, TPM, SO_2, Pb, and CO_2. The conditions of transport vehicle stock and transport network is poor and thus strongly affects the emission[37].

Labus 1995 made an effort to analyse the heavy metal emissions from coal combustion in South Western Poland Atmospheric As, Cd, Pb and Zn emissions from coal combustion in the upper order river basin (Poland) have been estimated for the period 1989-1992. The largest sources of metals emissions were individual stoves[38].

Barbone et al 1995 studied on air pollution and lung cancer in Trieste, Italy. To investigate the relation between air pollution and histologic type of lung cancer the authors conducted a case control study among men who had died in Trieste, Italy from 1979 to 1981 and from 1985 to 1986. Information on smoking habits occupation and place of residence was obtained from each subject[39].

Thacker 1995 conducted a detail study on contamination of urban water resources with organic pollutants. Organic chemicals in Indian water resources are responsible for, taste and odour problems, colour formation and oxygen depletion in water supplies. The extent of organic pollution load in any water resource determines the preferred treatment technology. In this study the concentrations of trihalomethanes, chlorinated hydrocarbon pesticides, chlorophenols, chlorobenzen and polynuclear aromatic hydrocarbons were monitored in the surface waters of a river and lake[40].

Anbazhahan and Kumaran 1995 worked on the industrial pollution in the Ayacut area of Kalingarayan Channel in Erode area in Tamil Nadu. Interview with cross section people proved that pollution has affected the crops and water resources. The study has successfully used the perception levels of the citizens to bring out the concern for industrial pollution[41].

Hall 1996 studied about the health effects of air pollution. The paper summarized the difficulties inherent in constructing estimates of health effect in population living in densely populated and polluted areas and suggests approaches to making initial limited estimates. To conduct a sophisticated study using relatively rich database is given based on work done in the Southern California region[42].

Palagiano and Cristaldi 1996 studied about the environment and health in Italy. The paper discusses the factor of environmental imbalance particularly pollution and car traffic in major cities and the inequalities in health case pattern[43].

Abbasi and Vinithan 1996 reports the impact of industrial activity on the landuse pattern, especially agricultural pattern of Pallayarkuppam. Kiruampakkam region of Pondichery. There was a pronounced shift from agriculture dominated activities to other type of commercial developments resulting in deterioration in the floral diversity and soil quality[44].

Edwin et al. 1996 conducted a study on the intensity of ground water pollution in Ariyalur Udayar Palayam regions of south India. The study reveals that ground water pollution occurs due to many sources which include chemicals and other toxic wastes of various agricultural and industrial activities[45].

Ranjan et al. 1997 have studied that mining activities adversely affect the surrounding environment. It has posed serious problems for human health and causes various diseases among mine professionals and local inhabitants. The discharged water as effluent containing soluble and insoluble particles causes serious water pollution[46].

Thulasimala and Sivagnanam 1997 made an attempt to study the environmental hazard analysis for Changalpattu district in India. The present study uses a health hazard index to estimate the health status of the area selected for the study. There is a definite spatial variation in the health status of the district[47].

Chauhan 1997 made an investigation of underground water pollution and water quality problems in the Rewa region (MP) with reference to health hazards. The most dominant diseases of the area were jaundice, dysentery, diarrhoea and typhoid were reported in the present study[48].

Swaminathan 1997 has taken an attempt to find out the noise levels in different parts of the city namely Madurai a metroplis in southern Tamil Nadu. It is also aim to findout how the noise level varies over selected locations in 24 hours a day. Finally some suggestions are given to overcome of the menance[49].

Rout et al 1997 discussed that in Raurkela steel plant the pollutants in general are dust particles, such as CO, SO_2, NH_3, H_2S, HCN, NO, noxious gases, fumes and mercury etc. The industrial units are emitting air

borne and water borne pollutants. Some remedial measures has been taken to control the pollution of the city[50].

Kumar and Dube 1997 studied that Varanasi city is facing severe problems of housing, congestion, overcrowding and traffic problems. This paper aims at focussing upon such problems which are faced by residents of Varanasi metropolis and their adverse impact on human health[51].

Anjum 1997 has taken an attempt to find out the overall habitat, environmental degradation and quality of life of Abdullahpur district Meerut. As a result of water and air pollution several diseases are prevalent in the area. The study area requires serious attention to maintain and protect environmental quality[52].

Anjum 1997 studied that the industrial pollution is spoiling water, air and soil of the surrounding region of Modinagar. The present study has been made to assess the environmental quality of Modinagar, an important industrial centre not only of district Ghaziabad but of the whole western Uttar Pradesh. An attempt has been made to find out the over all habitat conditions, environmental degradation of life in Midnapur[53].

The study of Narayan and Kumra 1997 under takes the analysis of effect of air pollution on human health in Varanasi city. The significant correlation between levels of air pollutants and incidence of respiratory diseases such as asthma, bronchitis, T.B., common cold in different localities of the city has been observed. Authors have suggested remedial measures to minimize air pollution to a considerable extent[54].

According to Pathak and Sinha 1997 the sources of pollution in Jharia mining areas are industries, urban activities, traffic and landuse under mining etc. Due to heavy air pollution and high respirable dust concentration causes diseases and general breathing problems. The authors have suggested that environmental management plan should be implemented with continuous monitoring in to reduce air pollution[55].

Chitraleka and Vidya 1997 discussed that the city of Chennai stands third in respect of air pollution in comparison with other metropolitan cities. The SO_2 level is highest in the month of June and lowest between September to November. The NO_2 is low in May and High in September to

October. The SPM level is high in all stations in February, June and November, while lowest SPM is reached in December and January[56].

Barai and Naseeba 1997, studied about an approach to integrated solid waste management system of Bangalore city. Efforts for years have been made by NGO's to encourage people participation integration of waste pickers and decentralizing composting in small waste scheme[57].

Kayastha 1998 has dealt with the environmental problems of Varanasi city. Environmental problems in Varanasi city relate to pollution of water, air, noise and societal aspects. Associated major problems are those of sewage and solid waste disposal changes in problem perception are of great relevance[58].

Singh and Rahman 1998 studied about the disposal of waste water, drainage around the house, and water logging problems especially among the low and high income household of Aligarh city. The result clearly show that overall city has a defective drainage system which led to water logging problem especially in the mohallas which are in depression and where poor people lives[59].

Rai et al. 1998, studied that the workers at pulp and paper mills are exposed to different pollutants such as noise, chlorine, dust, metal fumes and organic solvents. There are prevalance of various diseases such as bronchial asthma, rhinitis, pneumonia, fungal infection of skin and hypertension due to the above pollutants. Some remedial measures have been suggested to overcome of this problem[60].

Ramachandraiah 1998 in his paper entitled urban 'environmental degradtion- A study of air pollution in Hydrabad' seeks to analyse the rising air pollution levels as a consequences of growing number of vehicles in twin cities of Hydrabad and Sekandarabad. Some industries are also emitting huge quantity of SO_2 and NO_X. Finally author has suggested to adopt some improved technologies to decline the pollution levels in the city[61].

Hazra 1998 discussed about the arsenic poisoning in west Bengal. It takes into account various environmental factors including ecology and geohydrology of the area and the types of soils in relation to the occurrence

of this environmental pollution. It's presence in rock or soil leads to water contamination often resulting in arsenic poisoning in humans[62].

Singh and Rahman 1998 worked on the housing and health in low income household of Aligarh city. The study provides a coherent assessment of the housing conditions and the health effects on the life of the poor household. The conclusion is that there is acute shortage of housing in the city both quantitatively and qualitatively for the poor households[63].

Basu 1998 studied that haphazard and unscientific mining operations destabilize slopes, lead to excessive soil erosion and landslides formation of badlands, generate dust and noise thereby polluting the environment. Materials from slumps, landslides, coal and dolomite wastes choke up the streams leading to floods. All these spell disaster for the region[64].

In 1998 Kumra studied that the poor quality of environment of Kanpur is a result of several factors such as air, water, noise pollution and unsatisfactory garbage disposal and sewerage system. The present study relating to one of the worst hit urban industrial environments of the country has attempted in the above context[65].

Singh and Srivastava 1999, have conducted a detail study on problems and management of solid waste of Lucknow city. Out of 1608 tonnes of garbages generated perday only 1074 tonnes are disposed of due to insufficient number of vehicles. The garbage accumulated on streets market centres in residential colonies on roads and other places. On the basis of study it may be noticed that Lucknow city is facing severe health problem due to improper disposal of solid waste and its faulty management system[66].

Saxena 1999 has contributed on the study of air pollution and its hazards effects. In the present study it has been also discussed that the world wide efforts are going on the control of air pollution[67].

Saxena again 1999 studied that the rapid growth of population, urbanization, industrialization and increasing use of chemicals have resulted in water pollution. Sewage and polluted water are responsible for

several water-borne diseases. Author has also suggested some remedial measures to control water pollution[68].

Anand 1999 in his paper conducted a study on waste management in Madras. This paper examines how households in Madras view garbage problems, what their preferences are for improved services and what extent to which they would pay for them. The finding highlight how people are willing to cooperate and pay substantial sums for waste collection[69].

Dwivedi 2000 examines that the major pollutants of water are organic pollutants, inorganic pollutants, sediments, radio active materials and thermal pollutants. Pollutants can be treated through scientific advancement. The stages involved in the treatment of polluted water has also been discussed[70].

Katiyar 2000 studied that the main sources of air pollution in Meghalay are industrial activities, mining and also vehicular exhaust. The author suggests that the need of the hour is to adopt sustainable development programms for the state and take concrete steps to abate and control the problem of pollution[71].

Goswami 2000 aims to throw light on the effect of population growth on environment in the Urban areas of North Eastern region with special reference to water, air and noise pollution. Author has also suggested to improved the deteriorating environment[72].

Barman 2000 studied that in urban areas urban support systems have come under great stress and problems such as lack of cleanliness, pollution, loss of vegetation and over crowding have spoiled the beauty of towns, and cities and converted them into dirty polluted urban dwellings. NGO's have been set up to over come the cities problem of pollution[73].

Day 2000 observed that air pollution from industries and automobiles are causing a number of diseases like lung cancer asthma, and bronchitis. Automobiles and diesel engine exhaust contain lead which is carcinogenic causes severe problems. Finally author has suggested some remedial measures to overcome the problem of air pollution[74].

Sharma 2000 in her article pointed out that vehicular pollution is caused by the explosion in the number of automobiles, causing serious

health problems. A long term integrated approach is needed to over come of this problem[75].

Mwangi 2000 in her paper describes the serious inadequacies in the provision of water, sanitation, and solid waste management in Nakura-Kenya and also describes the localizing agenda 21 programme that was developed in the city supported by a variety of national and international agencies and NGOs[76].

Mandal 2000 studied that growth of urban population has created environmental problems of various types such as increasing the traffic, congestion, haphazard growth of colonies and environmental pollution. All these problems are subjected to improve through different planning measures.[77]

Das 2000 in her paper "Incidence of Asthma in Salt Lake city" studied that asthma an allergic reaction is quite wide spread in today's polluted world. In and around Salt Lake city most of the common trees and plants cause severe seasonal asthma among local residents during the time of pollution.[78]

Ghosh 2000 studied that air pollution load as suspended particulate matter (SPM) is found to be high in Calcutta. In this paper an attempt has been made to expose the association between levels of air pollution and health conditions of the people of Calcutta.[79]

Hazara 2000 examined that the toxic industries and automobiles exhaust have triggered acute respiratory illness, while noise pollution has disrupted the normal sleep and rest of the people living in Calcutta. The periphery of the city is characterized by a zone of water pollution. Though the significance and magnitude of the health problems of Calcutta have long been realised earnest effort to overcome the same have been taken up[80].

Basu 2000 studied that the management and disposal of solid waste posing a severe problem for the rapidly developing industrial city Durgapur of West Bengal. The researcher has taken an attempt to bring forward the direness of the situation and also seeks to find out possible remedial measures[81].

Dhar 2000 highlighted the nature and acuteness of air pollution problems in the Jharia coal field. To locate the vulnerable zones requiring necessary control measure[82].

Dhar 2000 in his paper "Environmental Legislation of Indian Mining Industry", highlighted, some of the environmental issues associated with mining industry and is expected to help an investor to assess the environmental obligations and issues prevalent in the country for making financial investment in mineral sector reference has been made environmental laws associated with industry in India.[83]

Somashekar et al. 2001 has taken an attempt to study the Environmental scenario of municipal waste management of Tumkur city Karnataka. The study reveals the open dumping and incineration of solid waste is responsible for environmental degradation. From the present study it is concluded that Tumkur city has an improper waste management system[84].

Basu 2001 made a detail study of problem of Arsenic contamination in drinking water of the Deltaic plain of West Bengal. This pollution has created a dovetailed problem which threats to health and hygienic condition and distorts the social balance[85].

Rahman 2001 conducted a detail study of assessing ground water quality in the shallow aquifers of Aligarh city. The study reveals that the concentration of heavy toxic metals especially Cd and Pb are above the permissible limit. This poses danger to a large section of people living in the city[86].

Day 2002 in his paper discussed about the environmental hazards around Kolaghat Thermal Power. West Bengal. The fly ash causes many environmental hazards like loss of fertility and increase of disease etc. Hence proper planning for the sustainable development of this area is very necessary as early as possible[87].

Kapadnis 2002 wrote that the deterioration of Nasik City's air quality is largely due to the number of vehicles. The air pollution study in Nasik city indicate that the average concentration values of air pollution such as SO_2,

NO_2, are within permissible limits, However such studies will have to carried out different spots in different seasons to assess the pattern[88].

Chand 2002 highlights the problems caused by tourism industry to the environment and stresses the need to develop environment friendly tourism in Himachal Pradesh as tourism has great potential in beautiful state[89].

Brahma 2002 worked on the problems of road condition in Chennai city. The article represents a detail analysis of the worrying road condition in Chennai metropolitan. Three issues are picked up here vehicular congestion, bad road conditions and environmental pollution to illustrate this problem[90].

Devi 2003 studied about the Air Pollution and health hazards in Talcher Augul Industrial region. The present study concems a highly industrialized region in Orissa and one of the twenty two hot spots' of India which is reeling under massive industrial pollution and environmental degradation. Air Pollution has been the most alarming phenomenon caused by a variety of manufacturing activities large scale coal mining, combustion of fossil fuel (coal) and Vehicular movement on roads and has brought about undesirable incidence of cardio-vascular and respiratory diseases among the people in Talcher-Angul industrial region. An attempt has been made in this paper to show the correlation between industrial pollution and the occurrences of certain diseases in this industrial region.[91]

According to a report of Parivesh 2003 air quality is affected not only due to conventional air pollutants but also due to odour. The present issue of Parivesh news letter is an attempt to throw some light on the causes and processes of odour formation and also sampling measurement and control technologies[92].

The present issue of Parivesh 2003 is an attempt to have a comprehensive scenario about ground water to promote better appreciation of the concept of sustainability and pool our efforts in conserving groundwater resources of our country. Depletion and deterioration of ground water quality have become a major issue of national concern[93].

According to another report of Parivesh 2003 entitled "Polycyclic Aromatic Hydrocarbons (PAHS) in air and their effects on our human health. Toxic air pollutants are hazardous and cause cancer and other serious health effects, such as radioactive effects on birth defects[94].

Singh and Asgher 2003 studied that the process of brick manufacturing is a source of environmental degradation. The brick kiln remains in controversy and possess a big question mark on the sustainability of the surrounding physical and cultural environment. In this paper an attempt has been made to locate the brick kilns lying in and around Aligarh city and to examine the environmental degradation caused by them[95].

Ahmad, et al. 2003 in their paper entitled "Impact of Deforestation on environment- A case study of Chotanagpur Plateau – studied that the most of the developing forests being destroyed at an alarming rate, posing threat to economy and ecology. In this paper an attempt has been made to measure the change in the area of forest cover of the study area at different points of times[96].

Chattopadhyay 2003 studied about basinal characteristics and environmental degradation case studies from selected rivers of Kerala. Higher levels of TSS and TDS due to land degradation has also been discussed[97].

Singh, et al. 2003 made a detail study on environmental effects of landuse changes in MWDR Nepal. In this paper an attempt has been made to analyze the changing land use pattern and its effect on local environment of the study area. Further more, the present land use system needs to change from traditional system to a new one, through integrating both biophysical and socio economic phenomena under the process of scientific and rational land use planning[98].

Tiwari and Rai 2003 studied on Air Pollution tolerance indices of few trees of Bhopal. Air pollution poses an acute problem for the world and its control through effective remedial measures is rather difficult. To reduce of air pollutants emitted from an industrial complex, growing vegetation around has been recommended by many scientists[99].

Ansari 2004 in his article Health care waste- A public health problem studied that for effective management of health care, waste, a nation wide concerted effort is needed to tackle the problem, periodical monitoring should be done to assess the efficiency of various disposal methods. There should be an adequate programme for proper collection, transportation and disposal of waste.[100]

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CHAPTER-3

GEOGRAPHICAL SETTING OF JAMSHEDPUR CITY

INTRODUCTION

Jamshedpur is one of the highly industrialized urban centre of Jharkhand State. The growth of Jamshedpur is solely connected with the growth of TISCO. The TATA's had originally decided in 1904 to utilize the iron ores from the Dhalli Rajahara range in the Drug district and set up the plant at a place called Padanpur on the banks of the Mahanadai river. However, Late Mr. P.N. Bose, who was then the geologist of Mayurbhanj state, drew attention of TATA's to the rich ore deposits of Gorumahissani Hills in Mayurbahanj (Orissa), subsequently it was decided to shift the venue of the steel works from Padanpur to Sinni. Owing to the lake of a large source of water supply at Sinni, the site was abondoned in 1907 in favour of Sakchi, which was about 20 miles away. Sakchi is situated at the confluence of two revivers Subarnrekha and Kharkai ensuring a perennial source of water supply. It was also adjacent to the Kalimati Railway station (now Tata Nagar) which lay on the main railway line.

Jamshedpur has an area of 25 square miles, bounded on the north by Subarharekah river, on the west by Kharkai river. On the South by eastern railway line between Calcutta and Mumbai and on the east by Cadastral survey boundaries of the different villages.

The first lay out of the town was prepared by Messrs Julin Kennedy Shalin of Pittsburg. U.S.A. A plan for starting the steel industry was conceived by Jamshedjee Tata long before the source of raw materials were known. In 1902 he visited the United States and certain industrial parts of Europe to study the conditions there, and engaged foreign experts for investigating the possibilities of starting steel industry in India. It was designed more or less on American lines with roads at right angles. In 1902 Mr. Frederick Charles Temple, who was then the Sanitary Engineer to the Government of Bihar and himself a town planner, was engaged as the Chief Town Engineer. In 1936 Major P.C Stokes, who was connected with Quetta after earthquake, was invited by the company to advice on town and development. In 1943 Dr. Keonigsberger was invited to advise on the

planning of the town, he prepared the master plan which was accepted by the steel company is now strictly adhered to.

Jamshedpur Block was established in 1952 and started functioning near western gate of Jublee park. In the year 1965 it was shifted to the present collectorate and functioned in this building till 1984 during this period the district constituted a part of undivided Singbhum. In the year 1985 the office shifted to the newly constructed block office at Khasmahal. Jamshedpur which is approximately 8 km from the present district collectorate and about 2 km from Tata Nagar Railway station.

3.1 PHYSICAL SETTING

Location

Jamshedpur i.e. the Jamshedpur Notified area is spreading over an area of 60 sq. km. The city is consisting of 19 wards, accommodates a residential population of 609,781 persons (Notified Area & Out Growth, census 2001). Jamshedpur Notified area has population of 5,70,349 persons. The city lies between 22°44'45"N to 22°50'15"N Latitudes and 86°9'0"E to 86°16'30"E longitudes Figure 3.1 shows the locational map of Jamshedpur City.

Physical Features

The physical features are divided into four sectors

(a) Northern Sector

To the north of this city lies the Patamda Block. To the North East, boundary of this city lies the boundary of west Bengal and the North West of the city lies the boundary of Chandil block of West Singhum and spread outs of famous Dalma forest. In the northern side of this block NH33 passes from West to East.

Southern Sector

After the southern boundary of block the boundary of west Singhbhum starts and the Kudada mountain range spreads out. In this sector the TATA, Chaibasa roads passes through and covers till Bhuridih.

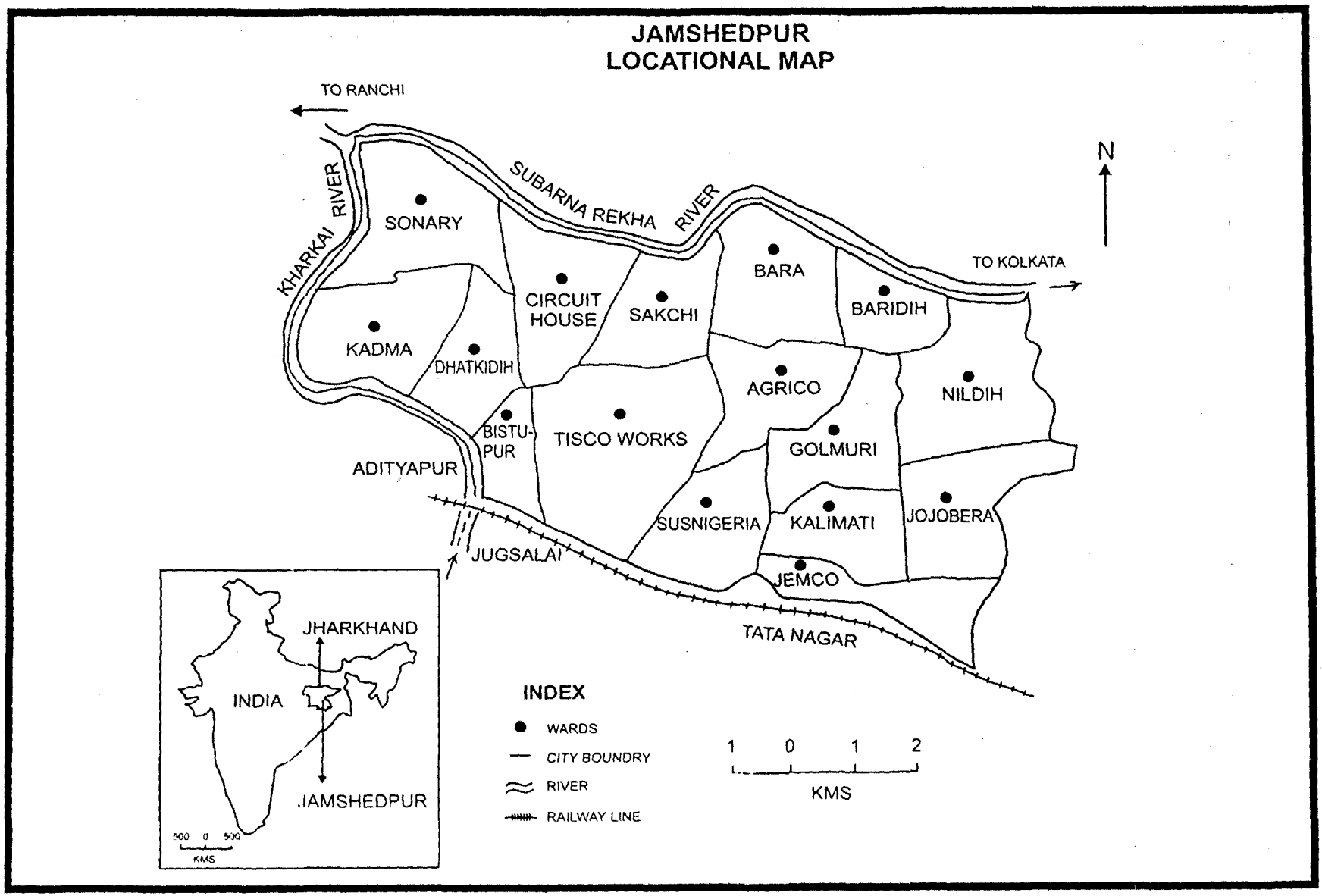
JAMSHEDPUR
LOCATIONAL MAP
TO RANCHI
KHARKAI RIVER
SUBARNA REKHA RIVER
TO KOLKATA
N
SONARY
CIRCUIT HOUSE
SAKCHI
BARA
BARIDIH
KADMA
DHATKIDIH
AGRICO
NILDIH
BISTU-PUR
TISCO WORKS
GOLMURI
ADITYAPUR
SUSNIGERIA
KALIMATI
JOJOBERA
JUGSALAI
JEMCO
TATA NAGAR
JHARKHAND
INDIA
JAMSHEDPUR
500 0 500
KMS
INDEX
WARDS
CITY BOUNDRY
RIVER
RAILWAY LINE
1 0 1 2
KMS

FIG. 3.1

Eastern Sector

After the eastern boundary of the city the boundary of Potka block starts.

Western Sector

After the western boundary of block the boundary of Gamharia block of West Singhbhum starts. In this region lies the kharkai river which separates the east and west singhbhum.

3.2 GEOLOGY

The area is composed mainly of archean, granite gneiss rocks with patches of Dharwar rocks (Phyllite, mica-Schists etc). On the northern and southern margins, the latter being very conspicuous in the iron ore and Kolhan series covering greater part of Singhbhum district. The Dalma range marks the belt of Archacan lava flows. The structural base of the region is provided by a series of batholithic instructions of granite into Dhawar strata, which were intensely metamorphosed by orogenetic movements. The earliest floor on which the Dharwar were deposited has not been recognized anywhere since it was subsequently metamorphased[1]. Jamshedpur lies on the central axis of this pre-existing range; the hills stretehing east and west of Dalma are on the site of northern slopes of the old mountain system. The great shear or thrust zones runs approximately ENE-WSW and E.W. for nearly 100 miles turning to the SE near the eastern end. There are two almost parallel thrust zones to the north of the great shear zone, one marking the northern limit of a broad belt of lavas (Dalma Traps) and the other further north[2].

Jamshedpur and its adjoining industrial areas fall in Purbi Singhbhum. The distirct forms part of the southern fringe of the Chotanagpur Plateau and is a hilly upland tract.

3.3 DRAINAGE

The principal rivers of the area are Subarnarekha and Kharkai. The Subarnarekha rises near Ranchi town and enters Singbhum from the north west. It flows south east through Dalbhum for almost 112 Kms, leaving the district at its south eastern extremity and flowing on through, Midnapur

district of west Bengal. Its bed is rocky and flow rapidly. It contains gold in minute quantity whence the name. There are many tributaries of the Subarnarekha river, the main being the Kharkai which is formed by two streams Torlo and Koranjai in the Kochan area. The Subarnarekha drains the south eastern part of the Plateau.

The river regime is highly fluctuating, with continuous flow only during the monsoon season and either completely dry bed or disconnected pools of water during the rest of the year. The rivers rise suddenly after the monsoon downpour but after a few hours they quickly subside to fordable level.

As the plant and the community increased in size, the quantity of water available in the Subarnarekha proved inadequate especially in Summer. A dam had been built across the nullah Dimna, a head stream of Subrnarekha in the Dalma ranges, with an approximate storage capacity of 58,000 milion gallons. As the demand for water increased the height of the dams was reised and the net storage capacity increased to 8000 million gallons.[3] So that water for industiral purposes is usually drawn from the river and for domestic consumption from the Dimna reservoir. In summer when the river level is low, water for industries is drawn from Dimna.

3.4 SOIL

The soils of the region vary according to the nature of parent rocks. The soil over the gneissic and granite surface is deep red or even black in colour because of the presence of highly ferrogenous biotite and horn-blend. The soils of the region contain high content of ferric oxide and bauxite which impact red colour to them. These soils vary regionally in colour, texture and fertility and may range from laterite or lateritic soils on the high plateau surfaces to yellow gray loams and black or brown soils in valley beds or predominantly lowland areas. The soils of the region are mixed red and black soils.

3.5 CLIMATE

Of all the physical factors, which exercise direct or indirect influence on mankind, climate is most fundamental for its impact is most persistent and obvious in all the fields of life.

The monsoon type of climate can be seen in the typical seasonal rhythm, which runs through all the elements of climate such as precipitation, temperature, pressure, wind and relative humidity. The climatic year is divided into three broad seasons.

1. The winter season (November to February)
2. The summer season (March to May)
3. The rainy season (June to October)

1. The Winter Season

During this period, the region experiences anti-cyclonic conditions. The high pressure system of North-Western India sends an arm in the south east which includes the plateau. The wind blows from the north west to south-east, but the actual direction of the wind is controlled by the relief features. The temperature remains between 60°F and 70°F. This period is characterized by charming clear and fine weather with pure air and azure blue sky. The days are slightly warm and sunny and the nights are cold.

2. The Summer Season

The temperature starts rising from the first week of March. During this period the sun gradually moves north wards and the duration of the day increases bringing more and more insolation to the area. The sun comes over the tropic of cancer on the 21st June, which passes through the northern portion of the plateau. With the commencement of the hot weather in March the temperature rises sharply until May. The monthly mean ranging between 29°C-32°C creating a low pressure area in the north eastern part of the plateau. The wind consequently blows from west with increasing velocity from 9.6 to 14.4km/hour[4]. By the end of May calms become more frequent and the westerly winds begin to cease and the seasonal low pressure establishes in the north western India. There is some precipitation in April under the influence of Norwester of west Bengal. The maximum temperature at Jamshedpur touched 44.6°C while lowest temperature recorded was 10.7°C.

Table 3.1: Temperature (°C) recorded at EMD laboratory.

Year	Maximum	Minimum
1996-97	46.5	10.4
1997-98	45.4	10.8
1998-99	47.6	10.4
1999-2000	46.2	8.8
2000-2001	44.6	10.7

Source: Environmental Performance Report Environmental Management TATA Steel, Jamshedpur (2000-2001)

3. The Rainy Season

During the season of rains (June October) the temperature begins to decrease with the onset of the South-Western monsoon. This season normally starts from the middle of June, when the monsoon winds bring rain-bearing clouds from the Bay of Bengal. The winds generally blow from east to south east. The wind velocity decreases gradually with the advance of season. Heavy rainfal, accounting from over 80% of the annual rains, is the most characteristics feature of this season. In the year of 2000-2001 Jamshedpur witnessed significant drop in rainfall i.e. 1148.5 mm as compared to 1933 mm during 1999-2000 as shown in table 3.2.

Table 3.2: Rainfall in (mm) recorded at EMD Laboratory

Year	Rainfall in (mm)
1996-97	1323
1997-98	1717
1998-99	1154
1999-2000	1933
2000-2001	1148.5

Source: Environmental Performance Report Environmental Management TATA Steel, Jamshedpur (2000-2001)

3.6 Natural Vegetation

Although much of the original vegetal cover has been depleted by reckless cutting and grazing. Some pockets of valuable forest still lie intact in the inaccessible parts of the region. There are three types of forests found over the plateau.

(i) Dry Deciduous Forest: It comprises a wide variety of stunted deciduous trees like Amaltas, semal, Harra, Khair, Palas, Mahua, Asanetc, mixed with bamboo and Sabai or Kus grass, such forests generally occur in river valleys amidst dissected terrain. The flat Plateau surface is generally covered with grass.

(ii) Dry Peninsular Sal: Dry Peninsular Sal is extensively found in the area. Sal is found mixed with bamboo and Catechu especially in the north western part.

(iii) Moist Peninsular Sal: This forest cover is located in Singhbhum where valuable timber is available from the stands of Sal and other species, notably Mahu, Kusum, Asam, Piar, Khair, Gambar, Anjan, Karanj etc. sabai grass and bamboo are also found in these forests. Teak has a limited distribution in Singhbhum valley.

3.7 Minerals

The city of Jamshedpur and the areas upto Ghatsila form the main belt having some of the biggest factories of their kind in this country. The remaining portion consist of either agricultural or mining areas producing iron ores and other ancillary minerals for the manufacturing of iron and steel. Iron ore is associated with the iron ore series of the Dharwars in the Kolhan area of Singhbhum district. In surrounding of the city hematite iron is occurring, having more than 60% iron content. Jones has estimated that a minimum of 10,47 million tons of ore averaging not less than 60% iron content crops out within Kolhan areas in Singhbhum[5]. Other important minerals are, uranium, Limestone, mica, copper and Bauxite.

3.8 Demographic and Cultural Setting

Population

In 2001 Jamshedpur had a total population of 609,781 persons (Jamshedpur NA & OG) and consisting of 19 wards. Jamshedpur Notified area with a population of 570349 persons spreading over an area of 60sq km, and city is consisting of 16 wards. There has been a rapid increase in the population of the city since 1951 when the population increased by 218,162 persons. The greatest increase was recorded in 1981-91. Jamshedpur has also registered rapid increase during the recent period. Table 3.3 shows the growth of population from 1911-2001.

Table 3.3: Jamshedpur Growth of Population 1911-2001

Census year	Total population	Decennial variation	Percentage variation
1911	5672	0	0
1921	57360	+51,688	+911.28
1931	83788	+26,378	+45.99
1941	148,711	+64,973	+77.59
1951	218,162	+69,451	+46.70
1961	291,791	+73,629	+33.75
1971	341,576	+49,785	+17.06
1981	438,385	+96,809	+28.34
1991	478950	+40565	+9.25
2001	570349	+91399	+19.08

Source: Census Record (1911-2001).

Table 3.4 shows the ward wise area, population and density of the city.

Table 3.4: Ward Wise Area, Population and density of Jamshedpur Notified Area, 2001.

S.No.	Wards	Persons	Male	Female	Area in Km^2	Density
1	Sonary	63325	32987	30338	4.72	13416
2	Uliyan Bhatia	51431	26872	24559	3.74	13752
3.	Dhatkidih, Contractor area Ramdas Bhatta	51805	27520	24285	2.61	19849
4	Bistupur	18213	9572	8641	1.93	9437
5	Works (TATA Steel)				7.20	
6	C.H. Area, N. Town	10323	5350	4973	3.77	2738
7	Sakchi, L. Town Kashidih	50846	27292	23554	3.84	13241
8	Bhuyadih. Bhalubasa S/Dera	39835	20832	19003	4.25	9373
9	Tuiladungri: Cable town Golmuri, Agrico Tinplate	94327	49710	44517	3.05	30927
10	Burmamaines	22144	11712	10432	2.58	8583
11	Bara	12624	6617	6007	3.96	3188
12	Baridih Birsangar, Namda, Golmuri Club	38223	20093	18143	3.12	12251
13	Baridih Basti, T.B. & Mercy Hospital	27027	14120	12907	2.91	9288
14	Moharda, Nildih	36971	19233	17825	4.13	8952
15	Birsanagar and Telco Area	-39803	21002	18801	4.70	8469
16	Jemco, Jojobera Cement Plant & Power Plant	13452	7169	6310	352	3821
Total		570349	300081	270268	60.03	9501

Source: Jamshedpur Notified Area, 2001.

Density of Population

The density of population in Jamshedpur city was 7580 persons per square km in 1981. In 1991 population density was 8009 persons per sq. km. During 2001 census the density of city was 9501/sq km, Figure 3.2 shows the ward wise population density of Jamshedpur

3.9 OCCUPATIONAL STRUCTURE

Occupational structure of Jamshedpur city in 2001 showed that there were 14727 long term employed in which 130858 male and 16669 female. The total number of part time job workers are 17869 comparising 14156 male and 3713 female. The total number of agricultural labourers are only 84 in which males are 71 and 13 females as it is an industrial region. In Jamshedpur 3926 number of people are indulge in business out of which 3261 are male member whereas 665 are female. The total number of other workers are 161305 in which 141613 are male and 19692 female. In case of unemployment the total number of unemployed people are 443372 in which 175568 people are male and number of females are 267804.

Table 3.5: Jamshedpur city: Occupational structure of population (2001):

S.No.	Title	Persons	Male	female
1	Long term employed	147527	130858	16669
2	Part time jobs	17869	14156	3713
3	Agricultural labourers	84	71	13
4	Business	3926	3261	665
5	Others workers	161305	141613	19692
6	Unemployed	443372	175568	267804

Source: Notified Area Jamshedpur 2001.

Literacy

Literacy rate of any area are is of great significance since they serve as one of the important indicators of the capacity of people to learn and adopt new technologies and methods of production both in industry and agriculture and to live a more healthy prosperous and active life. According to 2001 census about 460,475 persons (75.51%) were literate (Jamshedpur

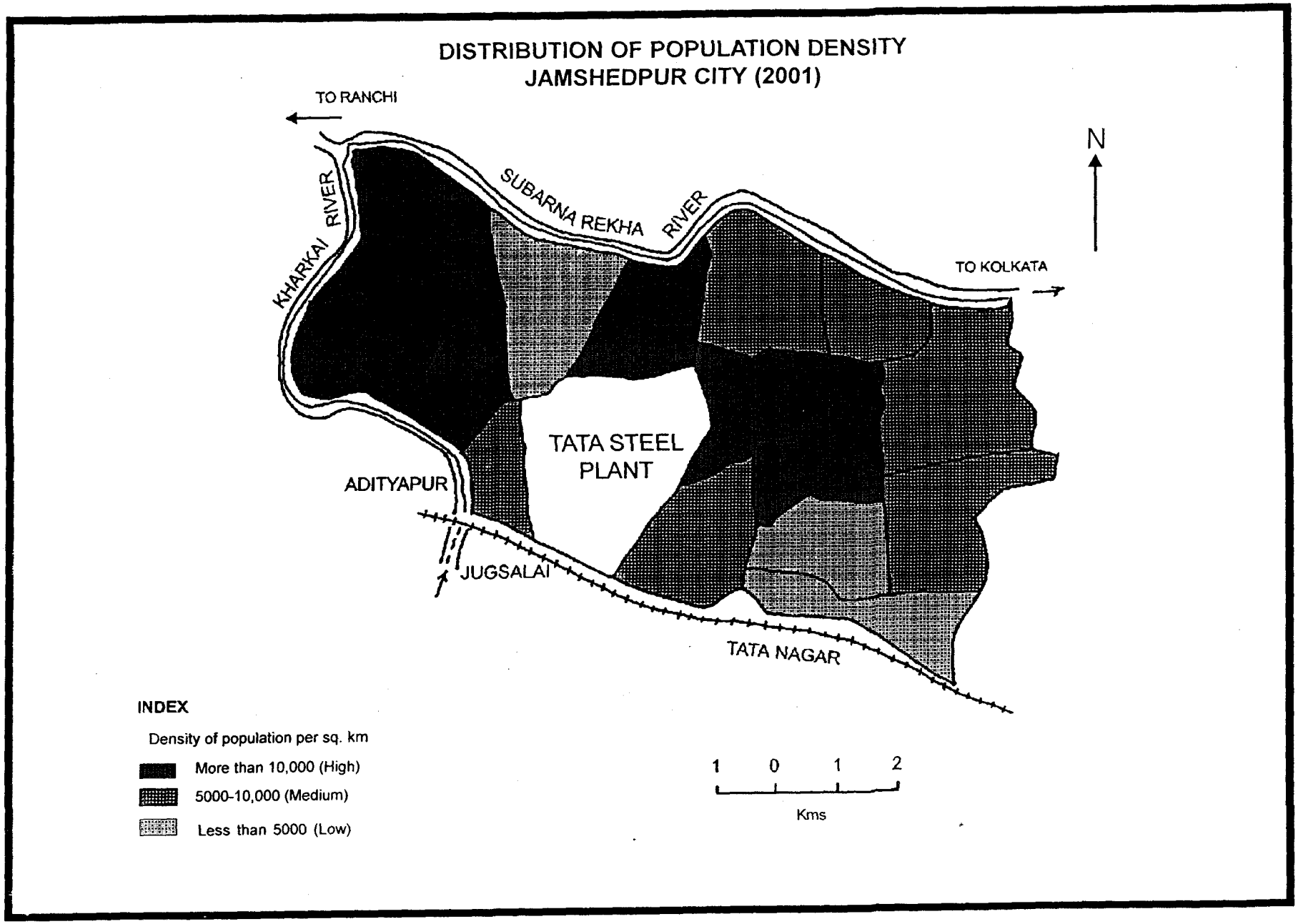
DISTRIBUTION OF POPULATION DENSITY
JAMSHEDPUR CITY (2001)
TO RANCHI
KHARKAI RIVER
SUBARNA REKHA RIVER
TO KOLKATA
N
TATA STEEL PLANT
ADITYAPUR
JUGSALAI
TATA NAGAR
INDEX
Density of population per sq. km
More than 10,000 (High)
5000-10,000 (Medium)
Less than 5000 (Low)
1 0 1 2
Kms

Fig. 3.2

NA & OG) in which 258,838 (80.56%) were males and 201,637 (69.89%) were females. According to 1991 census, the literacy rate was 81.2 percent in which 87.7% were males and 73.5% persons were female.

Transportation

Transport network is a dominant ingredient in development of socio economic and cultural life of a region. It plays an important role in creating contact between city or market and its tributary area and helps in the movements of goods and men efficiently. The basic structure of transport system of the region consists of network of roads and railways. Jamshedpur city is well served by roads and railways. The national highway runs through the area. Being the richest area in terms of minerals, the railway system has been suitably developed to ensure proper utilization of minerals. The Tatanagar railway station of the South Eastern Railway serves the flourishing industrial area of Jamshedpur and is easily the most important railway station in the district Singhbhum.

Airways

Jamshedpur has an airfield owned by the TATA Iron and Steel company. There is also a pilot Balloon observatory (D. Type) of the Meteorological department.

Trade, Commerce and Export

The city, is known all over the world as one of the largest steel producing centres in Asia. Jamshedpur, chiefly steel production centre, has steel as the most important commodity manufactured as also the most important commodity exported to other places.

Fair and Festivals

Important fairs and melas organized in various part of the city are as follows: Dussehra and Diwali mela, Sankranti mela Chaitra Sankranti mela, Rajashwal Sankranti, mela, Shivratri mela, Mahadeo Puja mela etc.

3.10 URBAN MORPHOLOGY

Jamshedpur is a typical industrial city with more than 70 percent of population engaged in industrial function. The morphology of the city is,

therefore, greatly influenced by the industrial function occupying the central position with its hub at Tisco. The road pattern is the outcome of four successive plans. The initial plan was prepared by J. Kennedy, which gave the city a rectangular pattern on the lines of the U.S. cities. Sakhi Boulevard was constructed as the main thoroughfare starting from Tatanagar station and terminating at Beldin. Bistupur and L. Town situated beside this road have a perfectly rectangular form. F.C. Temple (1920) avoided the straight geometrical pattern and taking the nature of terrain into consideration designed the roads in such a way that great rise and fall is avoided. His outer and inner circle roads follow uniform heights. Koeningsbergers plan (1943) introduced the neighborhood unit concept dividing the city into 12 zones and disfavouring the construction of continuous houses. Widely separate colonies were setup, each being a self sufficient unit in respect of essential amenities and services[6].

The functional morphology of Jamshedpur is simple. The industrial hub is surrounded by residential areas on the three sides by the colonies built on neighborhood pattern and on the fourth by the railway colony with its own typical features. On the outer fringes are to be found the parks, playgrounds, open spaces and eventually forest along the banks of the two bounding rivers, the Subarnarekha and the Kharkai. It is apparent that administrative function has little impact on the morphology of the city. Because it is not even a district headquarters. Similarly commercial function is also subservient to the industrial function. The wholesale business is confined to the south of the Tata Nagar station.

3.11 INDUSTRIES

Jamshedpur is one of the most important industrial center of Jharkhand. The major manufacturing industries of the region are based on the metallic mineral resources, and include the iron and steel and engineering industries of Jamshedpur. The important industries at Jamshedpur includes. Fig. 3.3

1. The TATA Iron and Steel company Ltd.
2. The TATA Engineering and Locomotive company Ltd.
3. The Tinplate Company.

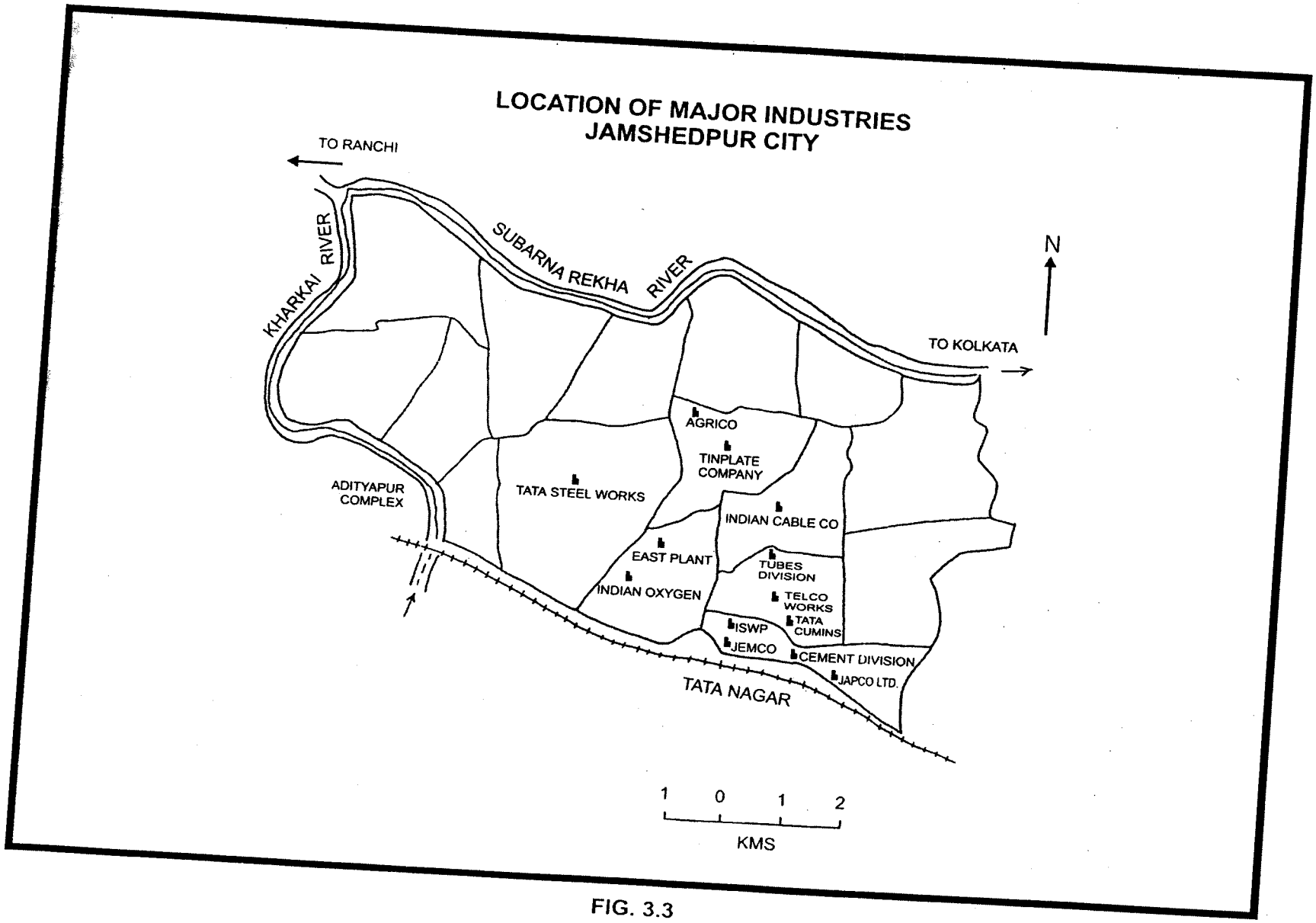
LOCATION OF MAJOR INDUSTRIES
JAMSHEDPUR CITY
TO RANCHI
KHARKAI RIVER
SUBARNA REKHA RIVER
N
TO KOLKATA
AGRICO
TINPLATE COMPANY
ADITYAPUR COMPLEX
TATA STEEL WORKS
INDIAN CABLE CO
EAST PLANT
TUBES DIVISION
INDIAN OXYGEN
TELCO WORKS
TATA CUMINS
ISWP
JEMCO
CEMENT DIVISION
JAPCO LTD.
TATA NAGAR
1 0 1 2
KMS

FIG. 3.3

4. The Indian Cable company.
5. Indian Oxygen company.
6. Japco Ltd.
7. Cement division.
8. ISWP.
9. East plant.
10. The Indian Tube Company.
11. TATA Cumins.
12. Agrico
13. Jemco, etc

3.12 INDUSTRIAL DEVELOPMENT

The availability of good quality of iron ore, cooking coal, and limestone provides excellent advantages for the growth of the cycle of ferrous metal industries. The high density of population in the adjoining. Plains of Bihar, Uttar Pradesh and West Bengal are sources of cheap labour and provide markets for agricultural implements fertilizers and consumer goods. A good network of broad guage double tract electrified or dieselised railways with main lines providing direct link to Calcutta, Delhi and Bombay and the branches extending directly to mineral raw material sources are most advantageous to a industrial plants. At Jamshedpur Tisco which manufactures a wide variety of iron and steel products, forms the hub around which a number of other factories manufacturing tinplate, electric cables and wires, locomotives, rolling stock, automobiles paper, machinery, heavy chemicals and refractories etc have grown up.

3.13 INDUSTRIAL LAND-USE

The lateral sprawl of Jamshedpur is due to the growth of factories and workshops in the city outskirts. The factories are situated to the east of the steel industry and have become the centres of crystallization of housing estates and the foci of daily streams of traffic carrying their workers to and from their homes. The workshops are situated close to the residential areas. They are small in size employing 20 to 300 people and use 50 to 150 HP of electricity. These are often in the owners home or in a shed in the back

yard; workers live near their place of work, residence place of work separation is minimum. Another characteristic feature is the small size of each unit. This is due to the fact that the entrepreneur has very limited financial support. These workshops are engineering, fabrication, pipes, welding, electroplating, cycle and motor repairing, foundry, pigment and cyanide, clock, printing, furniture, brick making, stone crushing, rice milling, flour milling, confectionery, ice factory and oil milling until the second World War Service Industries were small in numbers. Jamshedpur sent steel and allied products to the industrial belt of Calcutta and in return imported service goods. Only a few engineering industries were within the walls of the steel plant and compared to Howrah and Calcutta the numbers were not very large, because there was not much encouragement extended to the ancillary industries. (in this connection the Government report iron and steel (Major panel is revealing). (1) It has been mentioned in this report that finished and semi-finished steel from Jamshedpur used to cost more to the buyers in Jamshedpur than from Calcutta; for the simple reason that an additional freight rate was charged from the nearest port.[7] (2) Apart from the disadvantage of the cost of material, the middle-men operators had to depend for the supply of electricity and water on the steel company (3) an influx of a large number outsiders was not welcomed. (4) There was reluctance on the part of the large enterprises to depend on these middle-men operators, because the standard of production was not always maintained as the financial resources were meagre[8].

The major impact of the second World War and later the expansion of steel producing capacity to 2 million tons per annum accounted for the urgent necessity for inviting contractors to undertake construction jobs. After the war these enterprises managed to survive and extend their activities to others fields. An increase in vehicular traffic called for repair shops. Restrictions imposed on the expenditure of foreign exchange emphasized the growth of these small enterprises, e.g., plastic, engineering and foundry, and as a result of partition (of India) there was an influx of refugees, many of whom started workshops of their own or were employed by others in the rice mills, tailoring, engineering workshops and the brick Kilns.

Today the industries agglomerate in nine areas, namely

1. The station road in Jugsalai.
2. The Jamshedpur: Chaibasa road in Sundernagar, Karandi and Kahsmahal
3. The purulia highway in Mango
4. The mill and Godown areas.
5. The straight Mile road Sakchi
6. The Burma Mines area to the east of steel plant.
7. Golmuri Market
8. Dhatkidih, and Adityapur.

The units in Jugsalai and Mango are within closely packed residential area. Associated with the Tatanagar railway station, and extending along the station road of Jugsalai, this approaches nearest to Bistupur, the heart of the city and represents the first extensions outwards in the early 1940's.

The most striking are the workshops connected with light engineering industries. All these industries are tied to the points of accessibility, either to Bistupur, which is 7 miles away and the Tatanagear railway station. The engineering industries are registered as suppliers to the cable, steel, Tube, Tinplate and Telco. Paucity of space for workshops has driven them to the distance of seven miles from Bistupur. Connection with Tatanagar railway station is very close, due to control on steel, it has to be bought from the steel control in Calcutta or bulk shipments are made from Raurkela, Bhilai and Dugapur. Fireclay and coke are received form Dhanbad and Asansol.

So the connection with the railway station is vital Tatanagar on the Jamshedpur Chaibasa axis forms the focus of this pattern of growth. Road transport partly bears the burden of railway transport, sometimes billets and rods are brought by road too. This accounts for the growth of Mango. So extending from the riverbank, on the Purulia highway in Mango, there is a marked connection of these diverse units.

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CHAPTER-4

AIR POLLUTION- A Spatio Temporal Analysis of Jamshedpur City

The term air pollution may be defined as the situation in which the ambient atmosphere contains materials in concentrations which are harmful to man and his environment. The composition of ambient air changes continuously due to the emissions of natural and man made pollutants. With increasing population, expansion in industry and growth in agriculture the problem of air pollution is also increasing with an alarming pace. Green house effect and ozone layer depletion are few well known examples of air pollution problem[1].

The rapid rate of industrialization has resulted in more and more air pollution. Various industrial processes release almost all type of pollutants into the air. Some industries like cement, iron and steel, fertilizer, petrochemical, etc are of great concern because of the difficulty in controlling the emission of pollutants from them.

Air pollution as it is understood is the presence in breathable air of chemical elements or compounds in sufficient quantity to constitute injury to health or life over short or long time periods. The ambient air is considered as cause of localized atmospheric pollution. The air pollutants, i.e. substances present in the air causing pollution may be of particulate matter. (Solid or liquid) or gaseous (organic or inorganic)[2].

Carbon dioxide (CO_2) is a normal component of air and a part of the carbon cycle of the biosphere so, ordinarily it is not considered as a pollutant. But large quantity of CO_2 is produced due to the burning of fuel wood, coal, oil and natural gases. CO_2 has a property to absorb heat, radiation of the sun, so the presence of large quantities of CO_2 in the air may affect solar radiation. Carbon monoxide is not a component of dry air but a product of incomplete combustion of carbon or its compounds. It constitutes single largest pollutant in the urban environment. Nitrogen oxide (NO_2) is produced by combustion processes in the nature because some oxidation of atmospheric nitrogen occurs at flame temperature sulphur dioxide (SO_2) is probably the most significant single air pollutant,

coal is burn, sulphur is released mostly as SO_2. Concentration of SO_2 of more than toxic level is very dangerous for human health. Oxidants are gaseous pollutants, found in urban environment and these are related to ozone, these are produced by the reaction of hydrocarbons and organic vapours with oxides of nitrogen in sunlight urban areas with considerable automobile traffic are highly affected by oxide pollution. SPM (suspended particulate ,matters are air pollutants which mainly include aerosols fumes, mist and soot. It has been found the various sources of air pollution discharge pollutants in different amounts and concentration. In India about 5475 thousand tonnes SO_2 are emitted in the atmosphere from various sources. The level of air pollution in India is lower than that of developed countries, but increasing number of industries in cities contributes to high level of air pollution[3].

4.1 AN OUTLINE OF AIR POLLUTION IN MAJOR INDIAN CITIES

Urbanization in India is more rapid over the years cities have become a major centers for commerce, industry and education. Increase in population both endemic and floating increase in industrial activities, vehicular population etc have led to a number of environmental problems one of them being air pollution.

The air quality of different cities/towns with respect to these criteria pollutants has been compared with respective NAAQS (National Ambient Air Quality Standards) has been categorized into four broad categories are:

a) Critical pollution (C)

b) High pollution (H)

c) Moderate pollution (M)

d) Low pollution (L)

It is obvious from above categorization that the locations in either of the first two categories are actually violating the standards, although with varying magnitude. Those falling in the third category are meeting the standards of now but likely to violate the standard in future if pollution continues to increase and is not controlled. However, the locations in low pollution category have a rather pristine air quality and such areas are to be

maintained at low pollution level by way of adopting preventive and control measures of air pollution.

Table 4.1: Ambient air quality status of various cities/towns during 2001

Pollution level	Annual mean concentration range (mg/m3)			
	Industrial (I)		Residential (R)	
	SO_2 & NO_2	SPM	SO_2 & NO_2	SPM
Low (L)	0-40	0-80	0-30	0-70
Modenate (M)	40-80	180-360	30-60	70-140
High (H)	80-120	360-540	60-90	140-210
Critical (C)	>120	>540	>90	>210

CITY	SO_2		NO_2		SPM	
Area Class	!	R	I	R	I	R
Delhi	L	L	L	H	H	S
Dhanbad	-	L	-	M	-	C
Jharia	L	-	L	-	M	-
Jamshedpur	L	M	M	M	M	C
Raurkela	L	L	L	L	M	M
Lucknow	-	L	-	M	H	C
Varanarsi	-	L	-	L	-	C
Agra	-	L	-	L	-	C
Kanpur	L	L	L	M	H	C
Kolkata	L	L	H	H	M	C

Note : - Data not available/Inadequate

Source: Annual Report 2002-2003 Central Pollution Control Board, Ministry of Environment and Forest.

4.2 STATUS OF AMBIENT AIR QUALITY (AAQ) IN JAMSHEDPUR

The carbon monoxide (CO), sulpher-di-oxide (SO_2), oxides of Nitrogen (NO_X) and suspended particulate matter (SPM) are a few primary pollutant which together contribute more than 90 percent of total air pollution.

Present management taking cognizance of the environmental degradation and quality of life of the region, oppointed M/S National Environmental Engineering Research Institute (NEERI) Nagpur for undertaking studies on the establishment of regional assimilative capcity

with respect to air, water and land components of environment, as well as on the supportive capacity of human and natural resources in Jamshedpur region, a 15 km. radius of area around its factory.

The air samples are analyzed for sulpher dioxide, oxides of Nitrogen and suspended particulate matter in Board's Central Laboratory. Some meteorological parameters like humidity, ambient air, temperature, rainfall etc are also monitored simultaneously at the time of air sampling as the climatic conditions play vital role in transportation of pollutants from one place to other place.

The result of the ambient air quality conducted during (1992-93) and (1999-2000) are given in table 4.2.

Changes of Air Environment as Evident from Carrying Capacity Study.

Table 4.2: Ambient Air Quality (Pollutant concentration in $\mu g/m^3$)

Air Quality	**Status (1992-93)**		**Status (1999-2000)**	
	Min.	Max.	Min.	Max.
1. SPM				
Summer	223	444	152	360
Post-Monsoon	91	427	105	261
Winter	161	603	117	295
2. SO_2				
Summer	12	112	15	59
Post-Monsoon	6	98	11	63
Winter	14	148	11	60
3. NO_X				
Summer	7	20	25	83
Post-Monsoon	4	30	16	73
Winter	6	53	15	688

Source: Environmental Performance Report, Environmental Management, TATA Steel Jamshedpur (2000-2001).

Suspended particulate matter (SPM) is considered as a major indicator of air pollution. Infact SPM accounts 50 percent of all air pollutant. The variation in the level of air pollution depends on the time, season, location and the level above ground surface where samples are collected. Higher figures are usually recorded in winter due to inversion of temperature.

Table 4.3 indicates the industrial emission pollutant concentration in gm/sec.

Table 4.3: Industrial Emissions (Pollutant Concentration in gm/sec).

Air Quality	Status (1992-93)	Status (1999-2000)
SPM	1290	274
SO_2	150	671
NO_X	236	428

Source: Environmental Performance Report, Environmental Management, TATA Steel Jamshedpur (2000-2001).

It is clear from table 4.3 that as usual pollution in environment is continuously increasing because of industrial emission such as SO_2 has been increased by 150 in (1992-93) to 671 in (1999-2000), and NO_X 236 in (1992-93) to 428 in (1999-2000) respectively. In case of SPM it has been found diminishing data and control over it from 1290 to 274.

Table 4.4: Area source Emissions (Pollutant concentration in gm/sec).

Air Quality	Status (1992-93)	Status (1999-2000)
SPM	1468	2400
SO_2	733	1200
NO_X	356	582

Source: Environmental Performance Report, Environmental Management, TATA Steel Jamshedpur (2000-2001).

Table 4.4 shows the area source emission. (Pollutant). Concentration in (gm/sec). The table shows the increment of SPM, SO_2 and NO_X.

To know the actual concentration of air pollutants Jamshedpur city has been divided into 8 major zones (Fig. 4.1). samples have been collected from the 4 most polluted zones of the steel plant and similarly

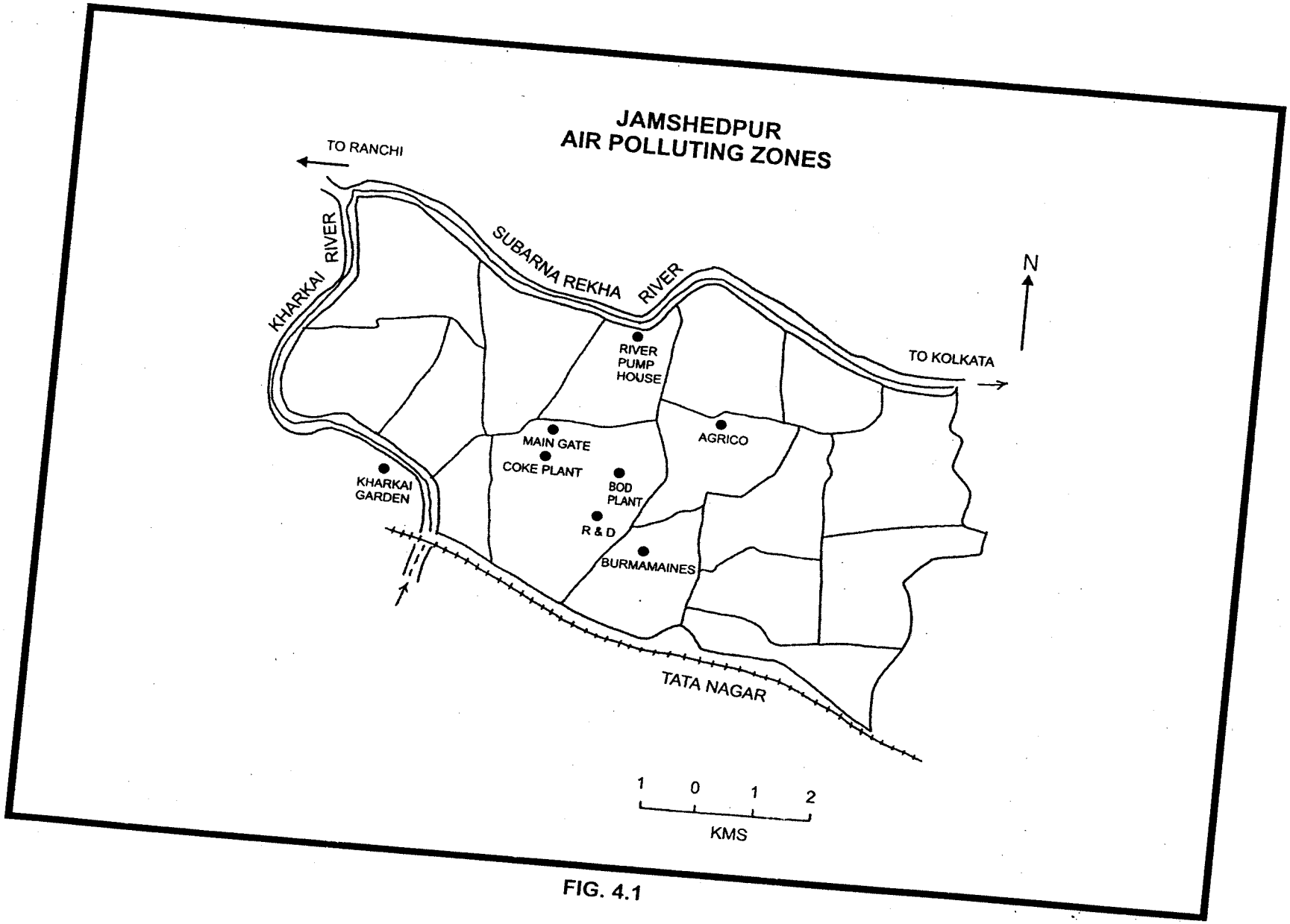

JAMSHEDPUR
AIR POLLUTING ZONES
TO RANCHI
KHARKAI RIVER
SUBARNA REKHA RIVER
N
RIVER PUMP HOUSE
TO KOLKATA
MAIN GATE
COKE PLANT
AGRICO
KHARKAI GARDEN
BOD PLANT
R & D
BURMAMAINES
TATA NAGAR
1 0 1 2
KMS

FIG. 4.1

whole of the Jamshedpur city has been divided into 4 zones according to the concentration of industries and major traffic functions.

Ambient air quality monitored at different locations inside steel plant and city includes the suspended particulate matter (SPM), sulphur dioxide (SO_2) and oxides of nitrogen NO_X.

Table 4.5 indicates the level of SPM of 4 critical locations of steel plant and 4 critical locations of the city.

Table 4.5: SPM levels ($\mu g/m^3$) in Steel Plant and Jamshedpur City.

Steel Plant/Location	**1998-1999**	**1999-2000**	**2000-2001**	**2001-2002**
1. Main gate	197	189	182	167
2. Coke plant	270	258	254	236
8. BOD plant	319	247	258	271
4. R & D plant	227	220	180	152
City Location	**1998-1999**	**1999-2000**	**2000-2001**	**2001-2002**
1. River pump house	216	225	204	178
2. Kharkai Garden	216	224.7	209	182
3. Burmamaines	230.4	247	213	210
4. Agrico	235.8	233	233	190

Source: Environmental Performance Report, Environmental Management, TATA Steel Jamshedpur (2001-2002).

Table 4.5 reveals that the presence of SPM in the ambient air of steel plant ranges from a maximum 319 $\mu g/m^3$ at BOD plant in (1998-99) and minimum of 152 $\mu g/m^3$ (2001-2002) at R & D plant (Fig. 4.2)

Where as in case of city the maximum concentration of the suspended particulate matter was 235.8 $\mu g/m^3$ at Agrico in 1998-99 and the minimum concentration was found 178 $\mu g/m^3$ during 2001-2002 in river pump house (Fig. 4.3).

The sampling stations virtually represent the areas of industrial as well as residential for which the SPM permissible limit is 500 $\mu g/m^3$. The concentration of SPM remain well within the permissible limit at all the locations. The status of SPM during 2001-2002 are shown in Fig. (4.4).

Fig. 4.2: Level of SPM in Steel Plant Jamshedpur (1998-1999 to 2001-2002)

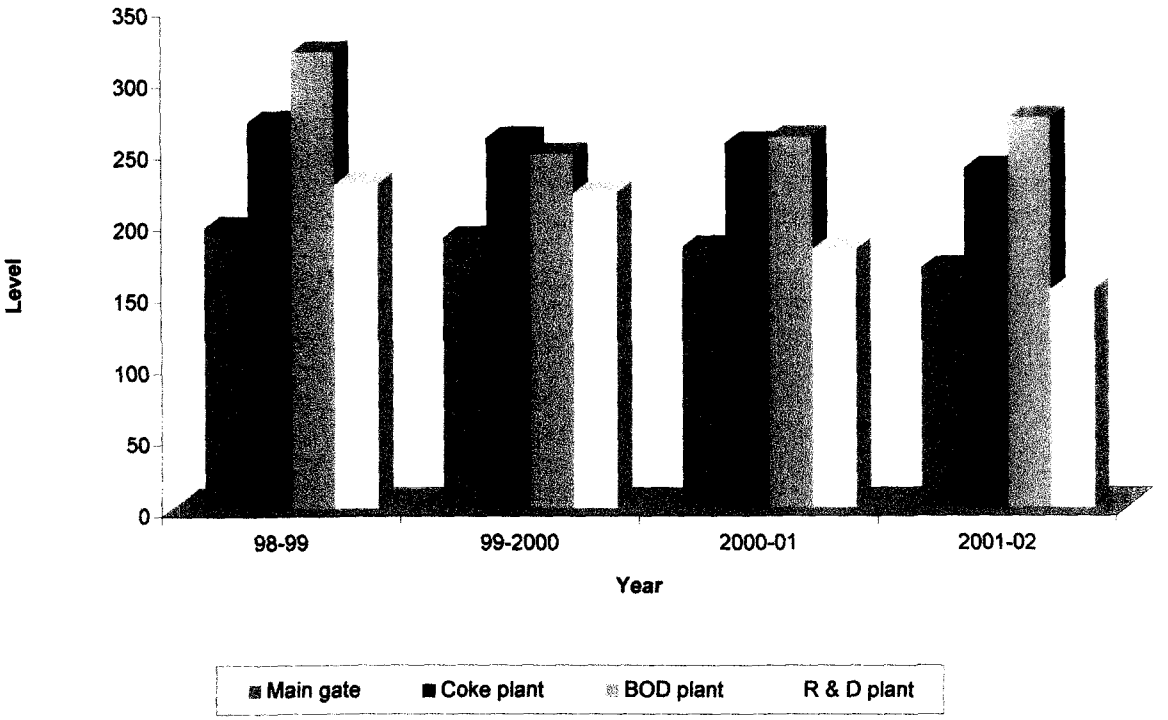
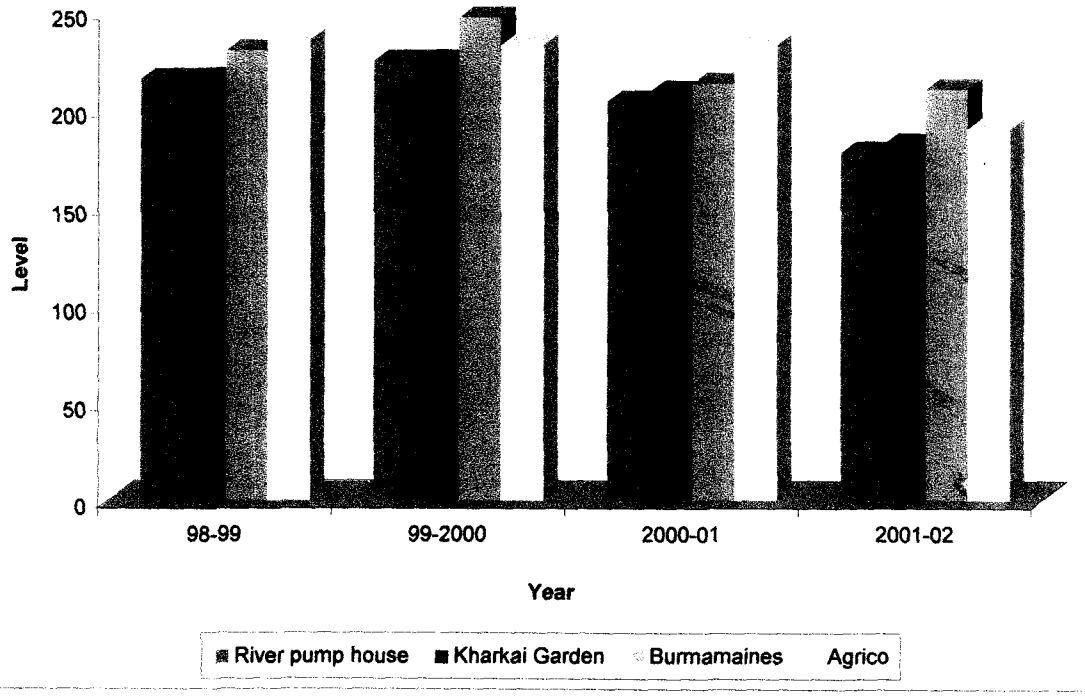


Fig. 4.3: Level of SPM in Jamshedpur City (1998-1999 to 2001-2002)



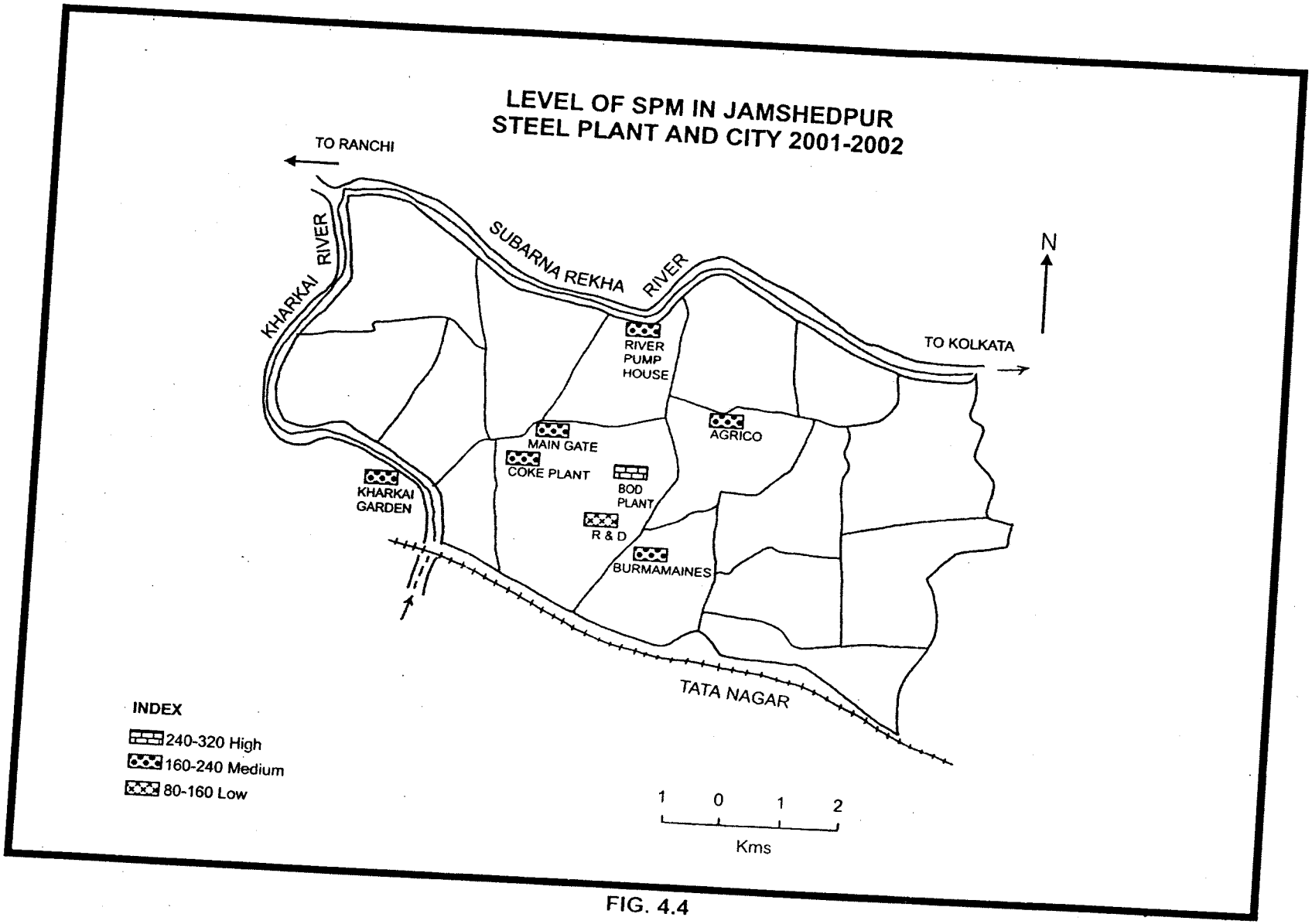

LEVEL OF SPM IN JAMSHEDPUR
STEEL PLANT AND CITY 2001-2002
TO RANCHI
KHARKAI RIVER
SUBARNA REKHA RIVER
N
TO KOLKATA
RIVER PUMP HOUSE
AGRICO
MAIN GATE
COKE PLANT
BOD PLANT
KHARKAI GARDEN
R & D
BURMAMAINES
TATA NAGAR
INDEX
240-320 High
160-240 Medium
80-160 Low
1 0 1 2
Kms

FIG. 4.4

Table 4.6 shows the level of SO_2 at steel plant and city.

Table 4.6: SO_2 levels at critical locations ($\mu g/m^3$) in Steel Plant and Jamshedpur City.

Steel Plant/ Locations	1998-1999	1999-2000	2000-2001	2001-2002
1. Main gate	58.6	49.8	41.0	35.1
2. Coke plant	74.2	64.2	57.0	49.6
8. BOD plant	71.8	59	52.0	47.6
4. R &D plant	61.5	24.6	43.0	38.4
City/Locations	**1998-1999**	**1999-2000**	**2000-2001**	**2001-2002**
1. River pump house	63.4	53.6	47	37.9
2. Kharkai Garden	55.8	51	44	38.6
3. Burmamaines	62.7	57.2	47	41.3
4. Agrico	60.8	52.1	46	37.4

Source: Environmental Performance Report, Environmental Management, TATA Steel Jamshedpur (2001-2002).

The ambient air samples reveal the presence of SO_2 upto a level of maximum 74.2 $\mu g/m^3$ in 1998-99 at coke plant and minimum 24.6 $\mu g/m^3$ in 199-2000 at R & D Plant (Fig. 4.5).

Reduction in SO_2 emission has been achieved by replacing fossile fuel by byproduct gases. An increase in SO_2 level at R & D is due to increased activity in the area for construction and operation of cold Rolling Mill.

In case of city level ranges from the maximum 63.4 $\mu g/m^3$ in 1998-99 at River Pump House and minimum 37.4 $\mu g/m^3$ at Agrico in 2001-2002 Fig. (4.6). A large number of automobiles plying through the River Pump House road and causes emission of unburnt gases in the atmosphere. In city the SO_2 level gradually deteriorate every year. The level of SO_2 in TATA Steel Plant and city has been shown in 2001-2002 (Fig. 4.7)

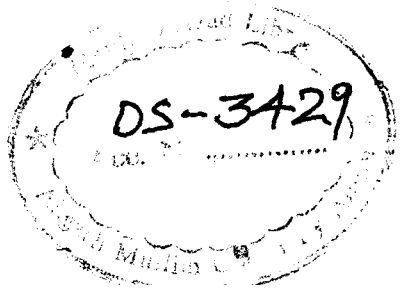


Fig. 4.5: Level of SO_2 in Steel Plant Jamshedpur (1998-1999 to 2001-2002)

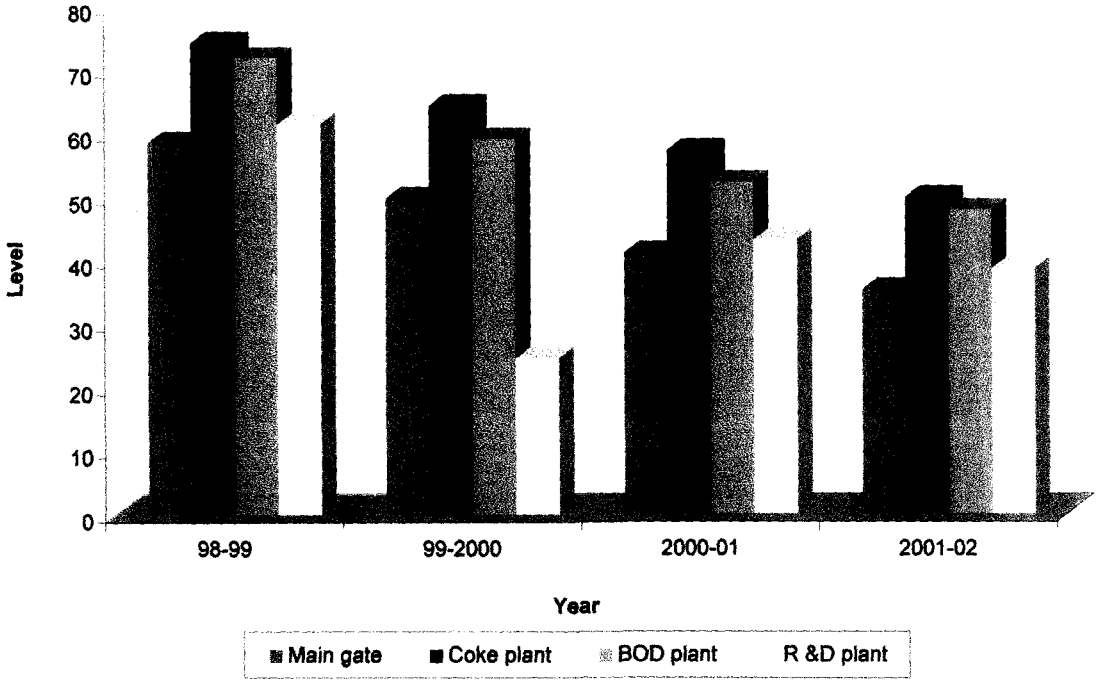
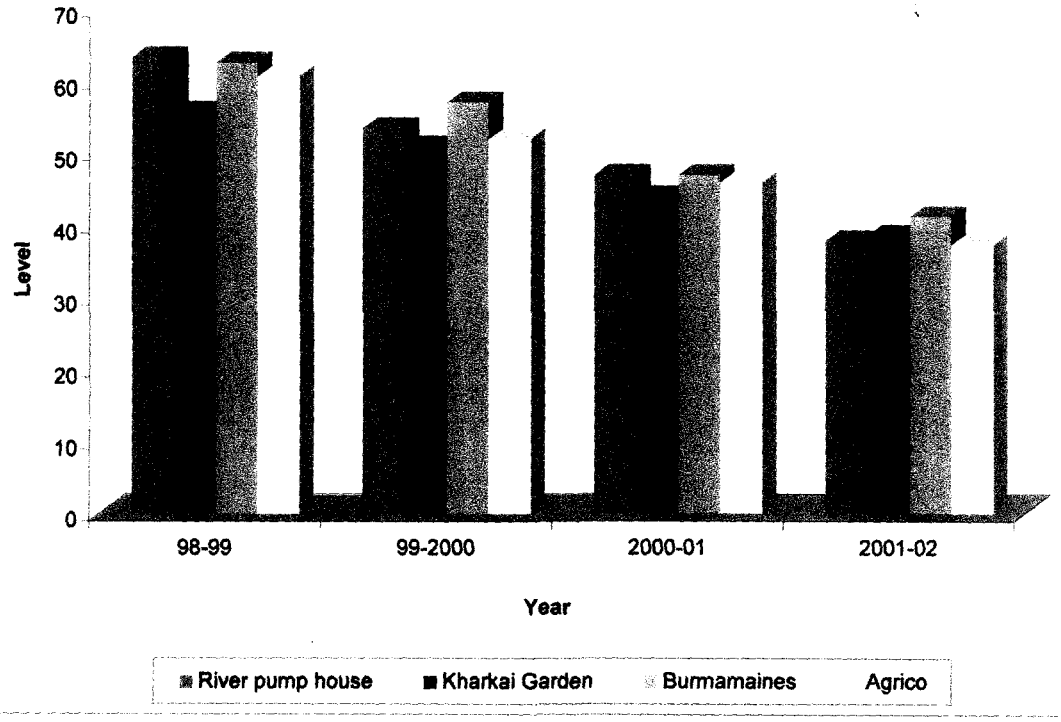


Fig. 4.6: Level of SO_2 in Jamshedpur City (1998-1999 to 2001-2002)



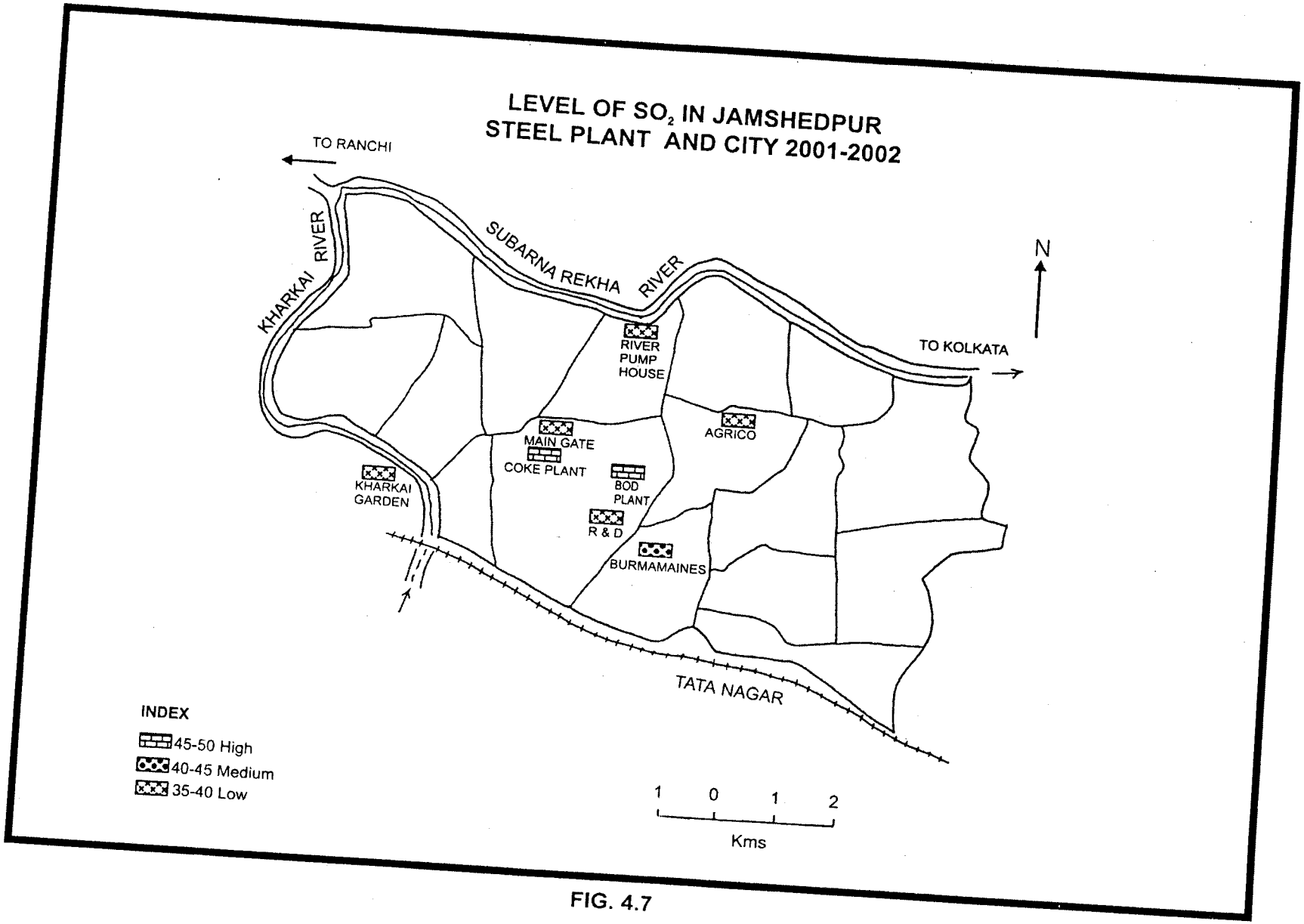

LEVEL OF SO_2 IN JAMSHEDPUR STEEL PLANT AND CITY 2001-2002
TO RANCHI
KHARKAI RIVER
SUBARNA REKHA RIVER
N
TO KOLKATA
RIVER PUMP HOUSE
AGRICO
MAIN GATE
COKE PLANT
BOD PLANT
KHARKAI GARDEN
R & D
BURMAMAINES
TATA NAGAR
INDEX
45-50 High
40-45 Medium
35-40 Low
1 0 1 2
Kms

FIG. 4.7

Table 4.7 indicates the level of NO_X in steel plant and the city.

Table 4.7: NO_X levels ($\mu g/m^3$).

Steel Plant/ Locations	1998-1999	1999-2000	2000-2001	2001-2002
1. Main gate	66.5	55.2	51	45.6
2. Coke plant	76.1	68	65	57.5
8. BOD plant	77.3	68	62	61.0
4. R &D plant	61.7	63.2	53	49.1
City/Location	**1998-1999**	**1999-2000**	**2000-2001**	**2001-2002**
1. River pump house	63.8	62.3	55	52.6
2. Kharkai Garden	60.5	62.4	55	50.8
3. Burmamaines	63.4	66.7	56	53.3
4. Agrico	67.5	63.2	57	48.4

Source: Environmental Performance Report, Environmental Management, TATA Steel Jamshedpur (2001-2002).

The data shows that the maximum level of NO_X was recorded 77.3 $\mu g/m^3$ at BOD plant during 1998-99 and the minimum concentration was recorded 45.6 $\mu g/m^3$ at Main gate in 2001-2002 (Fig. 4.8).

In case of city Agrico produced maximum level of NO_X 67.5 $\mu g/m^3$ 1998-99 and during 2001-2002 the level decreased to 48.4 $\mu g/m^3$ at Agrico (Fig. 4.9). Measures taken to reduce NO_X levels include development and adoption of low NO_X bunners. Fig. 4.10 shows the level of NO_X in steel plant and city during 2001-2002.

As a corporate citizenship TATA steel Monitors the effect of plant activities on the Ambient Air Quality (AAQ) in city regularly. Improved operating practices, effort to reduce every consumption and conserve natural resources have resulted in considerable improvement in AAQ of city.

4.3 STATUS OF VEHICULAR POLLUTION

Vehicular emissions have become the most significant and critical air pollutants because of the unprecedented increase in vehicular population in

Fig. 4.8: Level of NO_X in Steel Plant Jamshedpur (1998-1999 to 2001-2002)

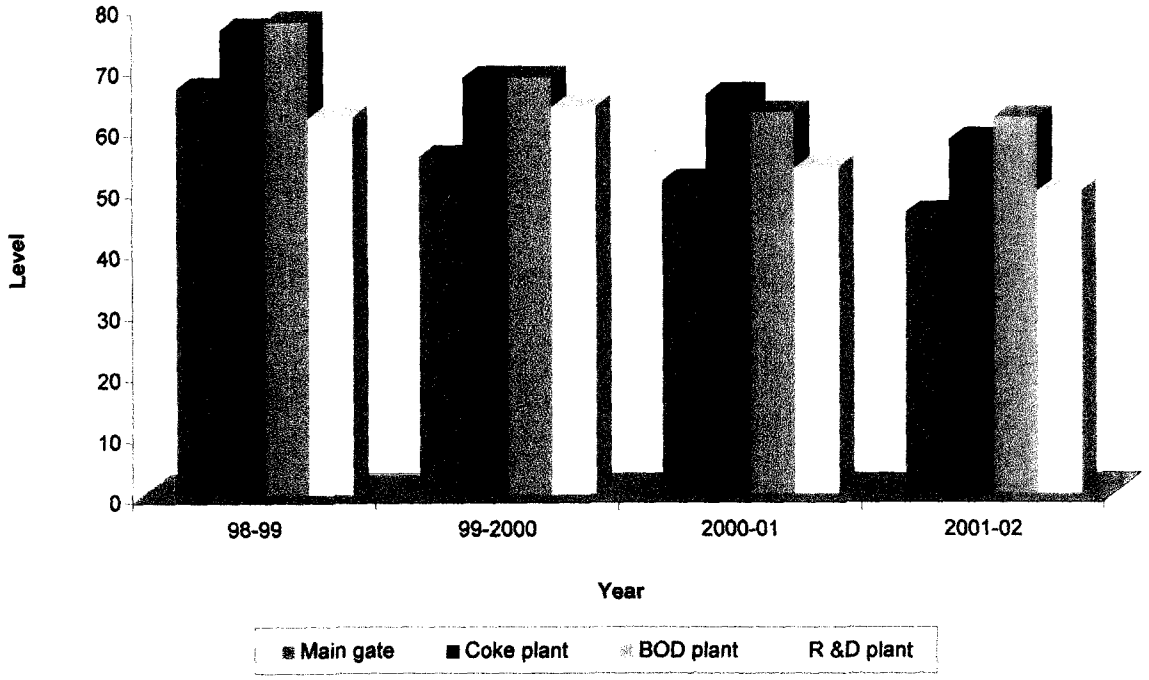
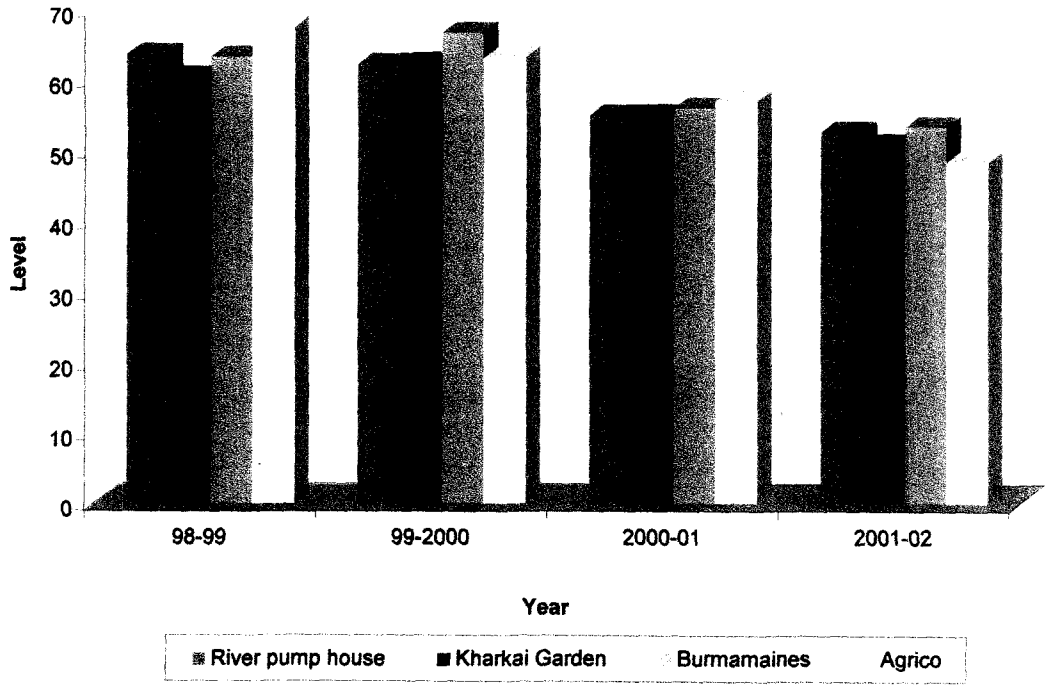


Fig. 4.9: Level of NO_X in Jamshedpur City (1998-1999 to 2001-2002)



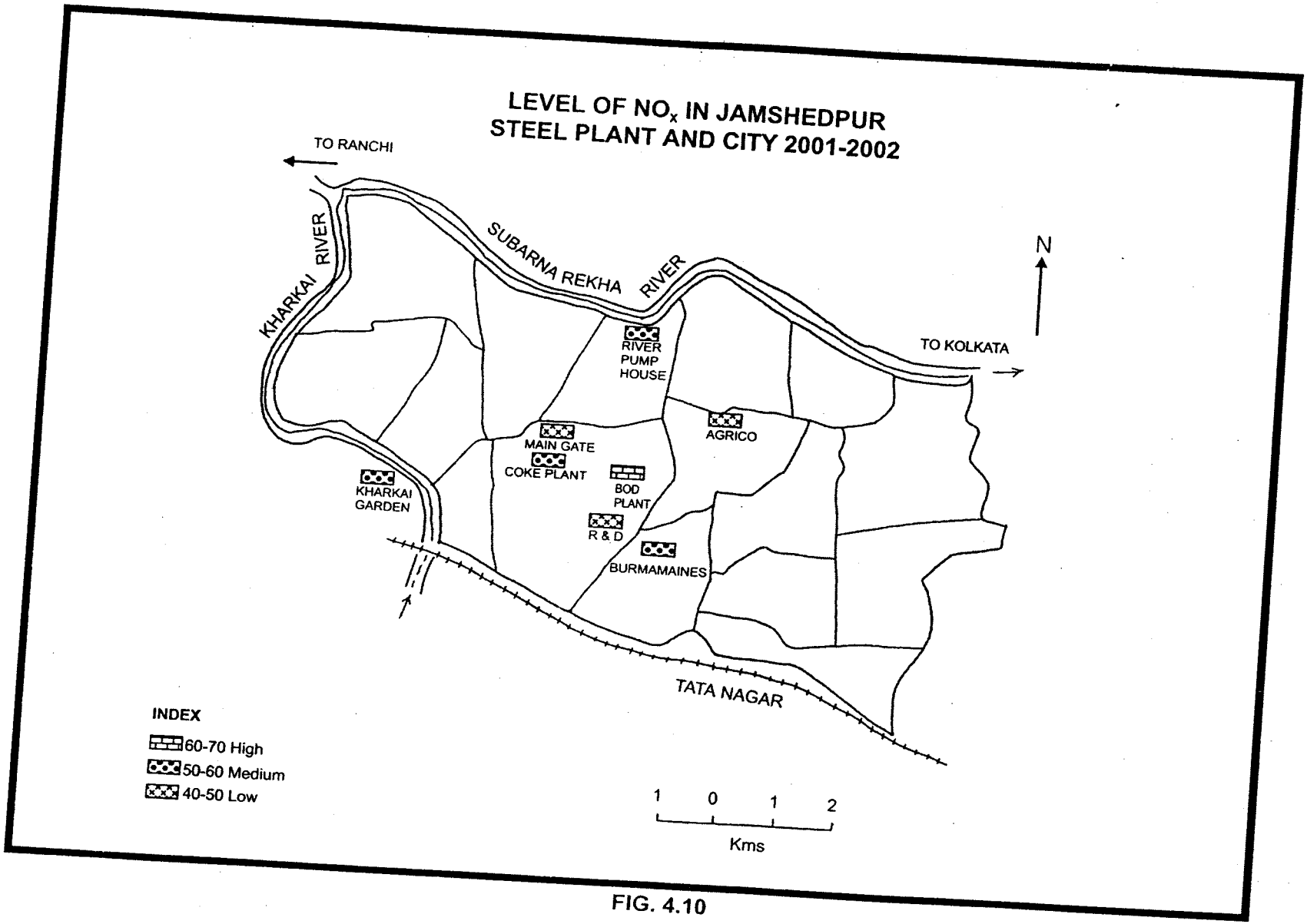

LEVEL OF NO_x IN JAMSHEDPUR
STEEL PLANT AND CITY 2001-2002
TO RANCHI
KHARKAI RIVER
SUBARNA REKHA RIVER
N
TO KOLKATA
RIVER PUMP HOUSE
AGRICO
MAIN GATE
COKE PLANT
BOD PLANT
KHARKAI GARDEN
R & D
BURMAMAINES
TATA NAGAR
INDEX
60-70 High
50-60 Medium
40-50 Low
1 0 1 2
Kms

FIG. 4.10

urban areas. Pollutants load released from vehicles depended not only on the number and type of vehicles but also on the extent they are used and also the various operational conditions. The air pollutant which are emitted from vehicular exhaust emissions mainly comprises of hydrocarbon HC. Carbon Monooxide (CO). Oxide of Nitrogen (NO_X), particulate matter, oxides of sulpher (So_X), Lead PH, odour and carcinogenic compounds like polynuclear etc.

The number of vehicles in the city has increased rapidly during (2003-2004) number of vehicle was recorded 25480, (DTO Jamshedpur E. Singhbhum).

The type and age of the vehicles and tunning of engines at regular intervals also influences the emission load. Besides these the vehicular pollution depends on the fuel characteristics and efficiency of combustion. It is felt that the quality of fuel used in India is one of the worst in the world. In the refining process, the reduction of aromatics will help in fuel economy and also reducing the emission of HC during combustion[4].

Table 4.8 shows the vehicular emissions of status 1992-93 and 1999-2000.

Table 4.8: Shows the vehicular emissions (Pollutants Lone in g/km).

Air Quality	Status (1992-93)	Status (1999-2000)
TSP	1455	3445
NO_X	58721	148318
CO	1572181	3873272
HC	881881	2145573

Source: Environmental Performance Report, Environmental Management, TATA Steel Jamshedpur (2000-2001).

It is evident from table that a great increment has been noticed in case of vehicular emissions. In 1999-2000 approximately more than double product of vehicular emissions have been produced, whatever produced in 1992-93. In 1992-93 TSP, NO_X, CO & HC were produced as 1455, 58721, 1572181 and 881881 whereas, TSP 3445, NO 148318, CO 3873272, and HC 2145573, respectively in 1999-2000.

4.4 AUTO-EXHAUST EMISSION

With many fold increase in vehicles plying on road. Auto exhaust emission has become major source for air pollution. Though lead free gasoline has made some reducing effect on lead concentration in ambient air majority of other pollutants has increased many times.

With a view to control the emission from automobile, TATA steel has conducted several compaigns inside works and township to monitor emissions through auto-exhaust. Inside steel works for which TATA steel has control, valid certificate for emission within norms is necessary to ply inside the plant.

Table 4.9 shows the auto exhaust emission as monitored by environmental management department (EMD).

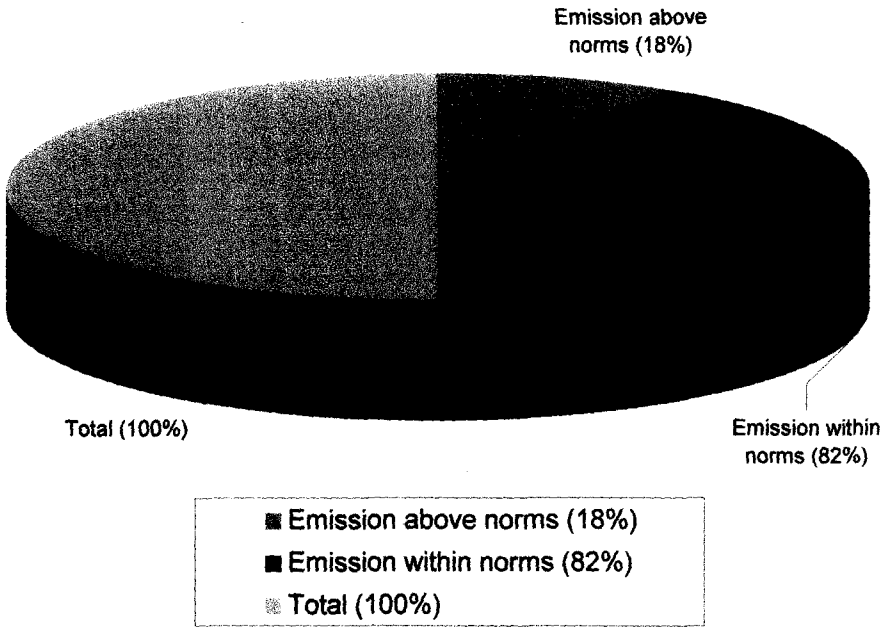
Table 4.9: Auto exhaust emission as monitored by EMD (2000-2001).

1. Status of emission monitored for diesel driven vehicles	
Emission above norms	18%
Emission within norms	82%
Total	100%
2. Status of Emission Monitored for Petrol Driven Vehicles	
Emission above norms	26%
Emission within norms	74%
Total	100%

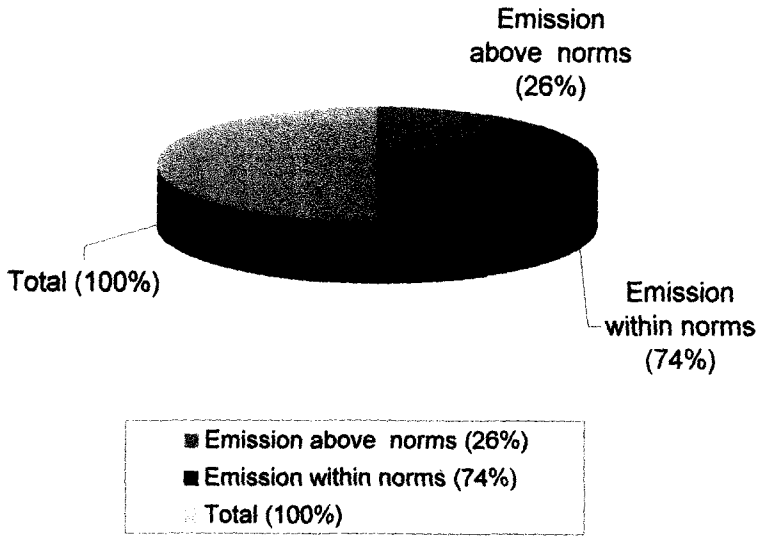
Source: Environmental Performance Report, Environmental Management, TATA Steel Jamshedpur (2000-2001).

As the vehicular exhaust emissions are also the main source of air pollution in the city. EMD has survey about the status of exhaust emissions of diesel driven vehicles. It was found that 18% emission was above norms and 82% emission was within norms for diesel driven vehicles (Fig. 4.11). Similarly survey was conducted for petrol driven vehicles also and found that the emission above norms was 26% and within norms 74% (Fig. 4.12).

4.11: Status of emission monitored for diesel driven vehicle (2000-2001)



4.12: Status of emission monitored for petrol driven vehicles (2000-2001)



The government of India has notified the guidelines under the central motor vehicle Act, 1988 and central Motor vehicle Rules, 1989 to manufacturers of the vehicles to control the problem of vehicular pollution from the grass root levels.

4.5 MEASURES FOR CONTROLLING AIR POLLUTION

World-wide efforts are going on to control air pollution. Scientist and technologists have developed certain measures but still progress in this field is not satisfactory. For the control of air pollution following steps will be helpful.

1. Control of Gaseous Pollutants

The equipments, which can be used to control gaseous pollutants are classified as combustion, absorption and adsorption equipments. Combustion is applicable to pollutant gases which are oxidizable. In petrochemical, fertilizer, paint and varnish industries combustion control equipments are useful. Absorption is a diffusional process in which the transfer of gas molecules into a liquid phase takes place. Such equipments include spray chambers, packed towers and sieve plate contractors, Absorption is a means of controlling air pollution which occurs due to some gases and vapours and inflammable compounds which cannot be treated by other means.

2. Control of Emission from Motor vehicles

The emission control techniques include tune ups, catalytic reactors and engine modifications. A high air – fuel ratio will reduce the concentrations of both carbon monoxide and hydrocarbons. The modified engines have an efficient system of burning of the fuel. At present, there is no system of reduction of sulphur dioxide although, researches in this direction are in progress throughout the world.

3. Control of Aerosol emissions

This can be controlled by arresters and scrubbers. Arresters include inertial separators, filters and precipitators. The electrostatic precipitator is considered to be the most effective device for preventing the emission of dust from fuel gases and is the standard equipment for large power stations.

4. Control by Fuel Selection and Utilization

Coal and oil are the primary fuels in which smoke, grit and Sulphur dioxide are the major pollutants. Coal pollutes more because it releases more smoke and carbon in the air. Instead of coal, oil can be used. But in oil, the amount of sulphur dioxide emission is higher. Therefore, fuel selection should be done properly and the harmful impact be restricted by inducing other chemicals. In order to control smoke, the coal is pulverized before being used. When oil is used for fuel, it is essential that the ratio of air should be maintained constant in order to prevent smoke emissions.

5. Control of Air Pollution by Site Selection and Zoning

Selection of an industrial site is the most important factor through which impact of air pollution can be minimized. The industrial site should be selected considering. (i) residential areas (ii) nature of industries and (iii) climatic conditions, specially the direction of winds. The site of each and every industry should have an approval from the department of environment. It should be approved in taking into consideration the long term perspective rather than immediate effects. Within the city the location of industrial zone is a critical aspect and town planners should have a check over its location as well as unorganized growth[5].

Apart from these controls legal controls are also there. The UNO and WHO have issued guidelines to its members for the formulation of laws regarding prevention of air pollution and accordingly all the countries of the world have enacted certain laws for its control. In India, the prevention of Air and Water Pollution Act1974, 1981, the Air Prevention and control of Pollution Act 1981, and the Environmental Protection Act 1986, have been enacted for air pollution control. These laws should be imposed properly, apart from this the most important aspect is public awareness about air pollution because the government alone cannot prevent pollution. It can be checked only through the combined efforts of the government, NGOs and the public.

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CHAPTER-5

SOLID WASTE- A SPATIO TEMPORAL ANALYSIS OF JAMSHEDPUR CITY

The generation and disposal of solid waste in the absence of proper management poses a serious threat to our environment and human health. Although the phenomena of solid waste generation and disposal are not new but its magnitudinal effects on environment has been realized in modern times when the generation of the waste becomes a serious burden beyond its proper disposal site. Its is directly related to rapid increases of population, industrialization, urbanization, fast changing life style and living pattern food habits and the culture of over-consumerism which gave rise to disposable and throwaway pattern of the solid wastes. Thus wastes are going up both in quantity and quality and its concentration is reaching beyond carrying capacity of the earth (Boojh 1996)[1]. The improper disposal of solid wastes affects the immediate surrounding of the air, water and land on one hand and creates human health problem through spreading of diseases on the other. The generation of solid waste is increasing year by year and its management is becoming difficult due to increasing pressure on urban areas (Rai 1996)[2]. Increasing population not only influence the quantity of solid wastes but also has a direct bearing on quality of solid wastes generation that varies from season to season. During rainy season, due to presence of moisture and socking of water the weight of the solid waste is higher while in winter and summer it becomes less. But during winter due to a higher proportion of vegetable materials the waste generation is more than in summer (Singh 1985)[3]. The researches reveal that each urban resident generates 350 to 1,000 grams of solid waste per day. It has been observed that per day solid waste generation in Delhi is 6000 tonnes, Mumbai 5,000 tonnes, Calcutta 3500 tonnes, Chennai 2500 tonnes, Ahmadabad 2,150 tonnes, Bangalore 2000 tonnes, Jaipur 1600 tonnes, Hydrabad 1300 tonnes and Lucknow generates about 1608 tonnes per day (Singh 1999)[4]. Whereas, Jamshedpur generates 400 MT solid waste per day.

Jamshedpur is one of the few industrial towns of India facing severe problems of disposable waste because of heavily concentrated industries. The industries and inhabitants generate lots of solid and liquid waste and these are disposed off on vacant lands creating health problems to its inhibitants. This is a very serious issue that has to be solved before masking any further deterioration to the environment.

5.1 GENERATION OF SOLID WASTE IN JAMSHEDPUR CITY

Being an industrial town, Jamshedpur is creating thousand and thousand tonnes of solid waste of varied nature. The table pertaining to annual generation of total solid waste clearly reveals that there has been a steady increase of solid waste generation from 1993-94 to 2003-2004.

Table 5.1: Generation of Solid Waste in Jamshedpur City, 2004.

Years	Solid waste generation in tonnes
1993-94	92943
1994-95	95767
1995-96	96686
1996-97	101138
1997-98	107378
1998-99	114826
1999-2000	112966
2000-01	118706
2001-02	119024
2002-03	123699
2003-04	125804

Source: Kasidih Health Depot Jamshedpur 2004

It is evident form Table 5.1 that during 1993-94 to 2003-2004 the solid waste generation in Jamshedpur city has increased from 92943 to 125804 tonne. The rapid increase in solid waste generation is largely attributed to increase in materials, growth of hotels, marriage halls, nursing homes, hospitals and commercial establishments etc., besides changing life

styles. The infrastructure has not been able to keep pace with the increase in wastes on one hand and technological means of disposal on the other.

5.2 SOLID WASTE COLLECTION ZONES

For the collection of municipal solid wastes Jamshedpur city is divided into 15 zones (Fig. 5.1).

Table 5.2: Ward-wise solid waste generation of Jamshedpur City (in M tonnes), 2004.

S.No.	Name of the Wards	Population	Area in sq. kms	Ward wise generation (in tonnes)	%
1.	Sonary	63325	4.72	10718	8.51
2.	Uliyan	51431	3.74	8450	6.71
3.	Dhatkidih	51805	2.61	8624	6.85
4.	Bistupur	18213	1.93	9762	7.75
5.	Works	0	7.20	0	0
6.	Ch-Area N. Town	10323	3.77	6809	5.41
7.	Sakchi	50846	3.84	11769	9.35
8.	Bhuyadih, Bhalubasa	39835	4.25	8217	6.53
9.	Tuiladugri, Golmuri, Tinplate	94327	3.05	9968	7.92
10.	Burmamaines	22144	2.58	7358	5.84
11.	Bara	12624	3.96	7025	5.58
12.	Baridih, Golmori Club, Namda	38223	3.12	7397	5.87
13.	Baridih Bastee, TB & Mercy Hospital	27027	2.91	7379	5.86
14.	Moharda & Nildih	36971	4.13	7108	5.65
15.	Birsa Nagar Telco Colony	39803	4.70	8071	6.41
16.	Jemco Jojobera	13452	3.52	7149	5.68
Total		5,70,349	60.03	125804	100%

Source: Kasidih health depot Jamshedpur, 2004.

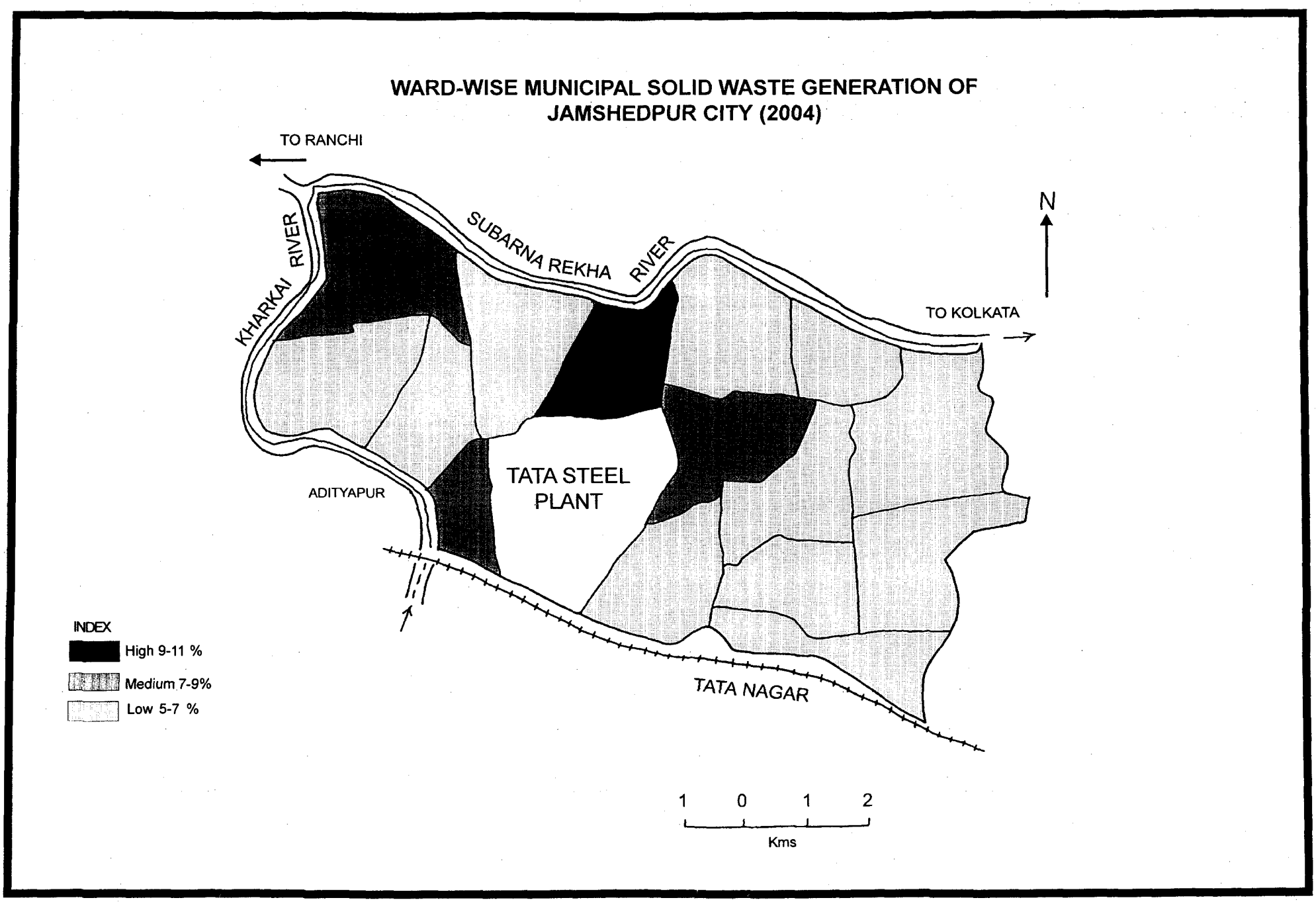
WARD-WISE MUNICIPAL SOLID WASTE GENERATION OF JAMSHEDPUR CITY (2004)
TO RANCHI
KHARKAI RIVER
SUBARNA REKHA RIVER
N
TO KOLKATA
TATA STEEL PLANT
ADITYAPUR
TATA NAGAR
INDEX
High 9-11 %
Medium 7-9%
Low 5-7 %
1 0 1 2
Kms

Fig. 5.1

Table 5.2 reveals that the ward-wise generation of solid waste and population are correlated. Although infrastructural facilities causes some control over the generation of wastes in the advanced areas such as Bistupur, Telco, C.H. Area, N. Town, and Nildih etc.

Table 5.3: Composition of Urban Solid Waste and Their Dominant Sites.

S.No.	Content	%	Dominant Sites	
1.	Paper	7.0	Market Area	Residential Area
2.	Plastics	15.0	Flat Complex Market	
3.	Metals	0.5	Sewer line	Market
4.	Glass	3.0	Basti	
5.	Ash and fine earth/ General waste	49.5	Basti	
6.	Vegetable matter/ Garden waste	25	Market	
Total		100%		

Source: Kasidih health Depot Jamshedpur, 2004.

Table 5.3 shows that the market and residential areas are the main sources of the generation of paper 7.0%. The city generates 15.0% plastics in Flat complex market areas. Sewer lines and market areas generates 0.5% metals. Ash and fine earth/ general waste account 49.5% from Basti. The city generates 25% vegetable matter and garden waste. Figure 5.2 shows the dominant sites of solid waste generation and disposal.

5.3 TECHNOLOGICAL OPTIONS IN RECYCLING WASTES

Judging from the nature of urban waste, generated waste management strategies are of two types. As most of the waste generated in urban areas is organic in nature, it can be recycled through a formal system, namely by composting the waste. In the city composting has been done in three major markets, which are as follows:

1. Sakchi,
2. Bistupur and
3. Kadma

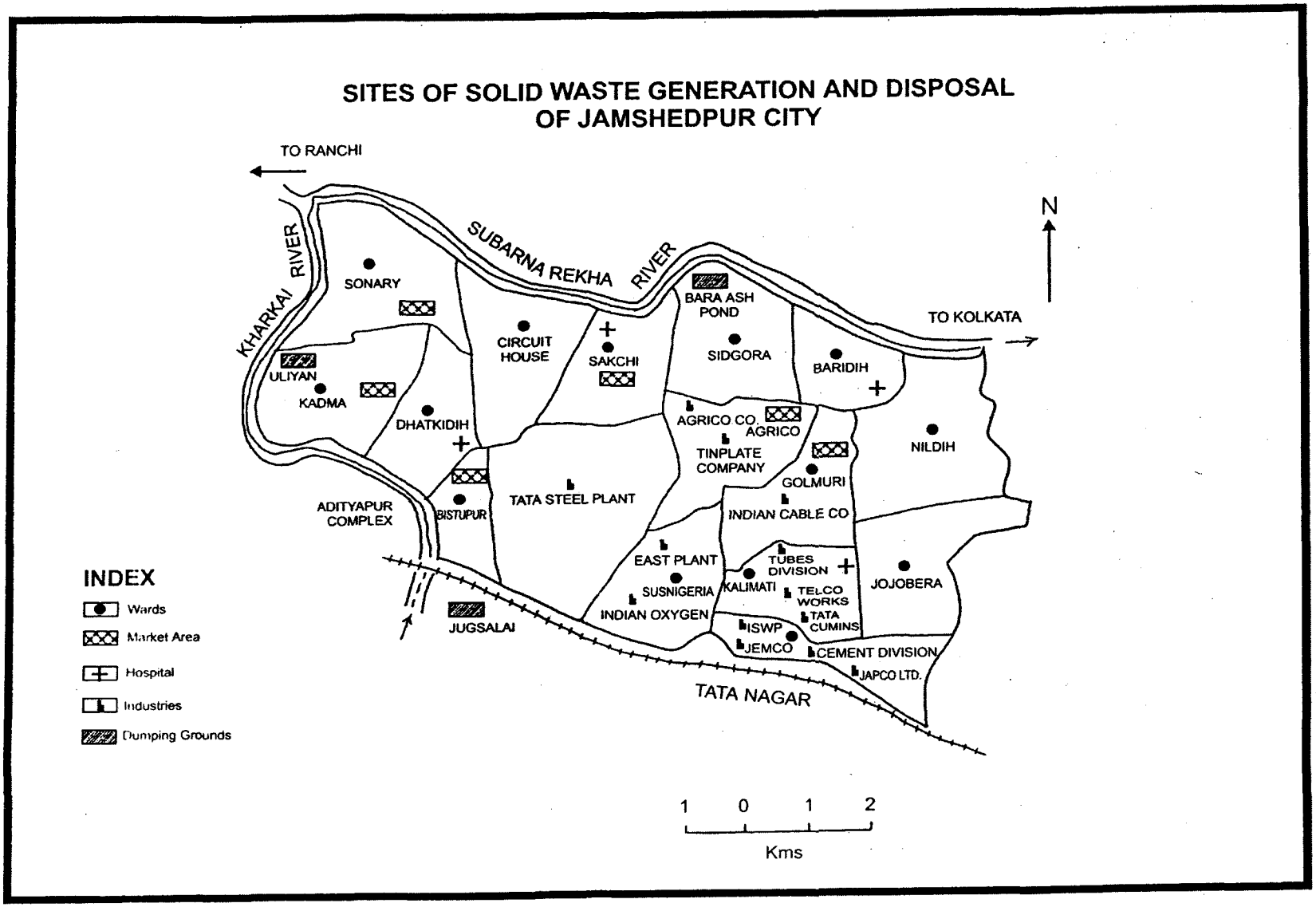
SITES OF SOLID WASTE GENERATION AND DISPOSAL
OF JAMSHEDPUR CITY
TO RANCHI
KHARKAI RIVER
SUBARNA REKHA RIVER
N
TO KOLKATA
SONARY
ULIYAN
KADMA
DHATKIDIH
CIRCUIT HOUSE
SAKCHI
BARA ASH POND
SIDGORA
BARIDIH
AGRICO CO.
AGRICO
TINPLATE COMPANY
NILDIH
GOLMURI
INDIAN CABLE CO
ADITYAPUR COMPLEX
BISTUPUR
TATA STEEL PLANT
EAST PLANT
SUSNIGERIA
INDIAN OXYGEN
JUGSALAI
TUBES DIVISION
KALIMATI
TELCO WORKS
TATA CUMINS
ISWP
JEMCO
CEMENT DIVISION
JAPCO LTD.
JOJOBERA
TATA NAGAR
INDEX
Wards
Market Area
Hospital
Industries
Dumping Grounds
1 0 1 2
Kms

FIG. 5.2

In residential areas composting is applied in 8 flat complexes such as: Subarnarkha Flat, KD flat, Professional Flat A, Professional Flat B, KF 4 IC Road, GF One, Bara Supervisors Flat and Bara Workers Flat.

The second option is informal management of non compostible waste through reuse and recycling. This informal system of waste recovery is through integrated system of non bio-degradable waste through waste pickers, itinerant buyers. Small waste buyers and wholesalers who in turn sell the wastes after sorting to recycling enterprises to form a hierarchy of integrated network systems.

For the handling and collection of wastes the metal bins are used. Metal bins are of two types.

	Metal bins	**Total No.**
1.	Dumper bucket	220
2.	Refuse compactor bin R.C.B.	310

For the refuse removal operation Nagar Nigam has employed 324 Safai Karamachari. Total number of collection points are 400. The refuse removal of Jamshedpur city consist of 35 vehicles which undertakes various trips. Hence dust bins instead of being cleaned daily in some places are cleared once or twice a week, leaving them to overflow with wastes. For the dumping of solid wastes land filing method is applied by the authorities.

Table 5.4 indicates the number of vehicles involved for the collection of solid waste of the city.

Table 5.4: Solid Waste Disposal System.

1.	Mechanical loader/JCB	5
2.	Tipper	12
3.	Dumper placer	5
4.	SLCM/Sewer line cleaning machine	2
5.	Refuse compactor	4
6.	Fogging Machine Mounted on Tata 407	2
7.	On Hire	
	(i) D. Placer	1
	(ii) Truck	4
Total		**35**

Source: Kasidih Health Depot Jamshedpur, 2004.

5.4 INDUSTRIAL SOLID WASTE

Industrial activities also generate a wide variety of waste products. These refusals causes health hazard. Majority of solid waste generated from steel works including blast furnace slag, BOF slag, sludge from gas cleaning plants, dust collected from pollution control equipment and mill scales produced in 1998-2001 have been listed in table 5.5.

Table 5.5: *Generation of Solid Waste Inside Steel Works (in tonnes).*

Items	1998-99	1999-2000	2000-2001
B.F. Slag	1225104 (327932)	1225745 (290983)	1148941 (256750)
L.D. Slag	857721	911529	983616
BF Sludge	37858	33201	38941
L.D. Sludge	51060	60130	53847
Mill Sludge	763	3785	4206
Mill Scale	80450	73929	72212
Flue Dust	54157	58686	57873
Lime Fines	115252	113825	124300
Dolo Dust	1281	3795	3266
Refractory waste	16641	16385	19171
Coal tar sludge	720	1250	1521
B.O.D. Sludge	-	-	304
Total	2441016 (1543844)	2502260 (1567498)	2508198 (1616007)
Crude steel production in (tonnes)	3264459	3435135	3566313
Slag rate kg/tcs	748 (478)	728 (456)	703 (453)

(Figure in parenthesis indicate values after accounting for granulation of BF slag which is used for cement making).

Source: Environmental Performance Report Environmental Management TATA Steel, Jamshedpur (2000-2001)

It is mandatory to take into account all types of wastes which come under hazardous category. Some of the wastes like sludges from BF gas, cleaning plant and part of LD slag respectively could not be recycled. BF gas cleaning plant sludge is being sold to outside authorised parties for reuse while part of LD slag is used for road making. The technique of recycling is one of the most advanced and effective techniques of recycling industrial waste.

5.5 UTILIZATION OF MAJOR SOLID WASTE

Keeping amendment 2000 to Hazardous waste in view generated solid waste are recycled or reused in different industries which have been listed in table 5.6.

Table 5.6: Utilization of Major Solid Waste.

Item	Usage details	2000-2001		2001-2002	
		Tonnes	%	Tonnes	%
B.F Slag	Cement making	902457	78.54	948265	79.68
LD Slag	Sinter making	489925	49.81	562204	55.98
B.F. Sludge	Domestic fuel	26376	67.73	37379	84.05
L.D. Sludge	Sinter making	52723	97.91	66902	95.28
Mill Scale	Sinter making	73342	100	64938	100
Flue Dust	Sinter and domestic fuel	21723	37.53	21000	35.81
Lime Fines	Sinter making	128927	100	123775	100
Dolo Dust	Sinter making	3262	99.88	3448	99.65
Ref. Waste	Sale	19074	99.49	10056	99.54
Coal Tar sludge	Coke making	1512	100	1967	100
B.O.D. sludge	Coke making	304	100	340	100
U/S lime stone	Sinter making	137999	100	104364	100
Total		185762	70.20	1947796	72.62

Source: Environmental Performance Report 2000-2001, Environmental Management TATA Steel, Jamshedpur (2001-2002).

Table 5.6 shows the statistics of solid waste utilization. It is considered that for maintaining the balancing of ecosystem it is necessary to either recycle the matter or reuse it in other purposes such as cement making, domestic fuel, sinter making and coke making etc. Such steps have been taken by industries which is reported as: (In year 2000-2001) 70.20% (185762 MT) of the total solid waste was used after recycling and similarly in (2001-2002) 72.62% (1947796 MT). Recycling is the best way to minimize such type of solid wastes. It helps to utilize the matter to maximum possible limit and reduces the quantity of the waste to the minimum.

The major causes of the pollution of the city is.

1. Production of surplus amount of pollutants from various sites of the city.
2. Improper disposal tendency of municipal wastes in some areas.
3. The dumping sites.

The most unhealthy and wrong step is the selected sites of waste dumping

1. Bara ash pond (Eastern side)
2. Uliyan (Western side)
3. Jugsalai muck dump area

Bara ash pond and Uliyan are situated on the bank of rivers as a result water get polluted. Jugsalai is also an active site of pollutant dumping which is full-fledged residential area. This leads to many epidemic diseases.

5.6 REMEDIAL MEASURES

The generation and accumulation of solid waste be it industrial or municipal has been persisting problem since the growth of industries in the city. Many health problems and environmental hazards are born due to improper disposal of these wastes. The proper management of solid waste disposal has been the most important concern for the authorities but they have yet to evolved a strategy to overcome the problem.

There are various methods, which can be best utilized for effective solid waste management in the cities. These methods are already in operation in various western and developed countries of the world.

The various methods which can minimize the wastes are as follows.

1. Recycling of solid waste
2. Sanitary landfill
3. Segregation
4. Composting of bio-degradable wastes

1. Recycling of solid wastes

Recycling of material is an important aspect that will definitely go long way in solving the garbage problem. Recycling refers to the process by which material once used again to substitute for waste materials.

2. Sanitary Landfill

A sanitary landfill is a place to bury waste comprising biodegradable and non-biodegradable material in a systematic and hygienic way without causing any nuisance or hazard to public health or safety.

3. Segregation

Segregation means separation and involves the separate collection of different materials under previously determined categories. Segregation is a very important activity that one must do before throwing out garbage.

4. Composting of Bio-degradable waste

Composting is one of the oldest forms of recycling. It is based on the scientific principle that nothing ever really disappears, but just changes shape and takes on new forms[5].

In this regard various important and affective steps have been taken by one of the most important industrial city Jamshedpur, which have proved effective in checking the various problems caused by solid waste disposal. Land filling and dressing of low-lying area with solid waste has risk to contaminate near by river basin. TATA steel has provided bund walls with stone pitching at locations of such potential risk.

It is proposed to collect waste at transformation proposed sites have also been chosen as cooperative collector. Several state of the art pollution control systems have been installed to prevent and control all types of pollution.

However keeping in view the growing quantity of solid waste production and the rapid increase in health problems it is the need of the time to take immediate steps to control and remove these problems through new and effective techniques.

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CHAPTER-6

IMPACT OF ENVIRONMENTAL POLLUTION ON THE HABITAT OF JAMSHEDPUR CITY

There are two different ways in which environment affects human health. The first is directly through pollutants discharged by industries into the air and water and by automobiles. In urban areas particularly the disease pattern is closely linked to the deterioration in the quality of air and water.

Urban health in developing countries has distinctive characteristics. There are communicable diseases on one hand and proliferation of non-communicable disease, triggered by urbanization and industrialization on the other. This dual characteristics complicates the problems of health[1].

Besides ill effects of the environment it generates permoting factors for the growth of many more diseases. Human health is also affected by the quality of the environment in the place of work. Air pollution, water pollution and solid waste generation and its improper disposal affects the environment adversely. Environmental degradation including the degradation of land and water is the most serious impact of this pollution. With the progress of research, it is becoming more clear that not only respiratory diseases but also cardiovascular diseases are caused by air pollution. It may be noted that the health effects of air pollutants depend not only on the strength of pollutants and duration of exposure but also on factors such as the individuals age, allergic tendency, pre existing lung disease, genetic factors exhaustion and cigarette smoking[2].

The bulk of domestic garbage industrial waste generated from various sources together with sewage waste pose a constant problem for the authorities of the resources involved. Solid waste is the most explicit pollution in urban areas due to their disposal sites or dumping areas. These landfills create sanitation problems instead of being situated at the outskirts of the city. These waste cause soil and water pollution both (surface and ground water) around the area. Table 6.1 indicates the changes of water environment and pollution load from TISCO to Subarnarakha and Kharkai River.

Table 6.1: Changes in Water Environment as Evident from Carrying Capacity Study

Pollution load from TISCO to Subarnarekha River						
Water quality parameters	Status (1992-1993)			Status (1999-2000)		
	Summer	Post monsoon	Winter	Summer	Post monsoon	Winter
BOD Load Kg/d	6918	7502	7441	562.8	624.4	691
Pollution load from TISCO to Kharkai River						
Water quality parameters	Status (1992-1993)			Status (1999-2000)		
	Summer	Post monsoon	Winter	Summer	Post monsoon	Winter
BOD Load Kg/d	1438	1668	1714	57.7	29.6	39.7

Source: Environmental Performance Report (2000-2001), Environmental Management TATA Steel, Jamshedpur.

Although pollutant load from TATA steel has reduced drastically. Pollutant discharge from private colonies and busties located near the rivers has increased significantly.

The balance of the ecosystem is disturbed in one or the other way because of these pollutants. The pollution of the city make people susceptible to various health hazards such as cholera gastroenteritis, malaria etc. Table 6.2 shows the nature of diseases in Jamshedpur from 1995 to 2002.

Table 6.2: Nature of Diseases and Persons Affected in Jamshedpur City

Year	Cholera	Gastroenteritis	Malaria Tisco area	Malaria non Tisco Area
1995	135	632	309	833
1996	91	540	356	1018
1997	47	330	285	756

1998	123	757	300	747
1999	27	281	300	999
2000	33	325	328	651
2001	40	402	244	628
2002	45	456	59	22

Source: Directorate of Health Bistupur Town Office Jamshedpur 2002.

Table 6.2 clearly shows that most of the people are suffering from cholera, gastroenteritis and malaria. Further it is revealed that the percentage of people affected by malaria is high in non- TISCO area.

Data Collection:

The data regarding health condition in Jamshedpur city has been conducted during December 2003 on the basis of sampling with questionnaire.

The questionnaire was designed in such a way as to get information regarding ailments of the people of the surveyed area. Age, sex, profession, monthly expenditure were also the questions included in the questionnaire.

The questions on illness were not based only on prevailing illness like bronchitis but also on their past medical history like suffering from tuberculosis, pneumonia etc. The question in respect of allergy was only dust related. People could specify the cause of their allergy. Questions in respect of asthma were asked whether it was acquired or hereditory. The data on cough was specified as being cough on its own.

For the collection of data 3 wards have been selected and three percent of the total households population have been analysed. While collecting data on health conditions mostly the middle class people have taken into consideration. Considering the standard of living of the people the author confined study to the middle class only. The people of middle class category are educated and have a better diet, they could also give proper information about their health condition both past and present.

Data analysis and result

The raw data on health survey have been processed and shown in table 6.3.

Table 6.3: Number of persons affected by Diseases caused by Environmental Pollution (Based on Field Survey conducted in 2003).

Location	Pneumonia	Malaria	Cough & cold	Typhoid	Jaundice	T.B.	Asthma	Gastro enteritis	Skin disease	Bronchitis	Total population
1. Sonary	3	13	17	9	4	2	8	12	7	16	347
2. Uliyan	2	10	13	4	7	1	5	8	5	13	256
3. Dhatkidih	5	14	19	7	9	3	6	14	11	14	330

The disease wise figures in Table 6.3 lack compatibility as the number of persons interviewed vary among localities. The figure appearing in each cell of the table has been changed to calculated the value to express the prevalence of occurrence of a disease by a formula $\frac{P}{O} \times 1000$

Where P = Number of disease

O = Total persons

The values thus calculated are shown in Table 6.4. Now the figures become compatible as they have expressed in terms of thousand.

Table 6.4: Prevalence of Diseases per Thousand persons as per sample survey in 2003.

Location	Pneumonia	Malaria	Cough & cold	Typhoid	Jaundice	T.B.	Asthma	Gastro enteritis	Skin disease	Bronchitis	Total population
1. Sonary	9	37	49	26	11	6	23	34	20	46	347
2. Uliyan	8	39	50	16	27	4	19	31	19	51	256
3. Dhatkidih	15	42	57	21	27	9	18	42	33	42	330

At this point of discussion the data of table 6.4 needed to be silhouetted. Thus interpretation will bring insight into the correspondence between human health and environmental pollution. The diseases like pneumonia, malaria, cough and cold, typhoid, jaundice, tuberculosis, asthma, gastroenteritis, skin diseases and bronchitis has been taken into consideration for impact analysis. Common cold that occurs during the change of seasons has been considered as normal.

Asthma is a chronic lung condition and affects people of all ages, inflammation of the airways causes hyper-irritation. It is often associated with cough, wheezing and shortness of breathe.

Bronchitis is the inflammation of the lining of the bronchial tubes. These tubes the bronchi connect the windpipe with the lungs. When bronchi are inflamed and infected, less air is able to flow to and from the lungs and a heavy mucus or phlegm is coughed up. When breathing becomes difficult and causes pain in the chest it is bronchitis. Besides inhaling air pollutants mainly sulphur dioxide and industrial dusts are the causes of bronchitis. Bronchitis is seen to be more common among the people going to works. Jaundice and gastroenteritis are also very common.

Pneumonia and tuberculosis are not directly caused by SPM. Pneumonia refers to an infection of the lung. Exposure to high level of nitrogen dioxide may cause pneumonia. Air pollution is responsible to cause pneumonia and tuberculosis indirectly by causing injury to the tissue of the lower respiratory organs and making them ideal breeding grounds for any sort of infection.

CONCLUSION AND SUGGESTIONS

After forgoing discussion regarding the impact of environmental pollution on human health, it may be concluded that ill effects of the environment invited many more diseases which adversely affects the health of the people. To overcome and reduce the magnitude of the ill effects of environmental pollution in generating different diseases and their adverse affects on the health of the man and environment, some suitable suggestions and recommendations have been made in sequent manner.

Policy for Cleaner and Greener Environment

TATA Steel reaffirms its commitment to minimize the adverse impact of its operations on the environment. Towards this end, it shall endeavour to.

1. Set sound environmental objectives and targets, and integrate a process of review, as essential elements of corporate management.

In order to continually improve the environmental performance, Tata steel has developed a system for setting and reviewing the objectives and targets which form a part of management. Score card and development "Key performance measures".

2. Install, maintain and operate facilities to comply with applicable environmental laws, statutes and other regulations.

TATA Steel has adopted a third generation approach to visualize environmental issues at the planning stage of a project. This has resulted in selection of cleaner technologies, installation and operation of pollution control measures for better environmental performance.

3. Conserve natural resources and energy constantly seeking to reduce consumption and wastage.

Tata steel has taken steps for continual improvement by conserving natural resources and energy. Thus has resulted in significant reduction in raw material consumption, energy consumption and improvement in product yield.

4. Minimise process waste, and promote the recovery and recycling of materials.

Steps taken for optimization of resource usage have minimised process waste at every stage of production. Initiatives taken for reuse/recycle of waste generated through scientific evaluation have significantly improved the recycle/reuse percentage.

5. Phase out pollution prone processes and install-state of the art technology for pollution, prevention and the continual improvement in environmental performance.

Tata steel has closed down a number of energy intensive, pollution prone processes like, open hearth Furnaces, old Top charge Batteries, old Rolling Mills etc. These units have been replaced with more efficient and environment friendly facilities.

6. Develop and rehabilitate waste dumps through afforestation and landscaping.

Tata steel has carried out massive tree plantation in and around the Township and waste dump sites. The dump sites have been provided with bund walls and stone pitching to avoid possibility of collapse of slopes.

7. Regular monitoring of air, water and noise pollution.

Ambient air quality are regularly monitored to assess the level of pollution in different zones. Auto exhaust emission is monitored for all the company owned vehicles to prevent vehicular pollution. Effluent discharge quality is monitored for all the drains as well as individual processes to ensure effective control over pollutant discharge. Noise level is also monitored regularly at all the noise prone locations to check the current status and plan preventive actions.

8. Develop an environmentally aware workforce.

TATA steel has always believed that training is an integral part of individual skill development. Hence training always remains on top priority to achieve better output in terms of productivity and environmental performance.

If all the measures and recommendations as proposed or implemented with judiciously and honestly by the government and Quasi governmental agencies, NGO's as well as the mass of the people, it is hope

that in days to come the magnitudinal effects of environmental pollutions on man and environment will be reduced to a greater extent and the inhabitants will enjoy the fruits of efforts and will make a sigh of relief from the adverse onslaught of the environmental pollution.

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PROPOSED PLAN FOR Ph.D. WORK.

1. NOISE POLLUTION IN JAMSHEDPUR CITY

i. Causes of Noise Pollution.

ii. Effect of Noise Pollution.

iii. A Spatio temporal analysis of Noise Pollution.

iv. Remedial Measures for controlling Noise Pollution.

2. WATER POLLUTION IN JAMSHEDPUR CITY

i. Causes of Water Pollution.

ii. Effects of Water Pollution.

iii. A Spatio temporal Analysis of Water Pollution.

iv. Remedial Measures for controlling Water Pollution.

3. SOCIAL POLLUTION IN JAMSHEDPUR CITY

i. Causes of Social Pollution.

ii. Conditions of Housing.

iii. Conditions of Bathroom and Sanitation.

iv. Household water supply.

v. Systems of Sullage and Drainage of water.

vi. Household garbage and solid waste disposal system.

vii. Problems of unemployment.

viii. Remedial Measures for controlling the social pollution of the city.

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APPENDIX-1

QUESTIONNAIRE

Topic: Impact of Environmental Pollution on Socio-economic conditions of inhabitants in Jamshedpur City.

(1) Ward No. (2) Area of the Ward

(3) Mohalla/Colony (4) Date (5) Time

(1) General characteristics of the Respondents

1) Sex (i) Male (ii) Female

2) Age (in years)

(i) 15-25 (ii)25-35 (iii) 35-45 (iv) >45

3) Religion

(i) Hindu (ii) Muslim (iii) Sikh (iv) others

4) Total income per month (in Rupees)

(i) <1,500 (ii) 1,500- 2,999 (iii) 3,000 – 4,999 (iv) 5,000-9,000 (v) >9,000

(2) Basic Family Characteristics

(1) Who is the head of the Family?

(i) Father (ii) Female (iii) Male earning member (iv) Others

(2) Number of families living in a house

(i) One (ii) Two (iii) Three (iv) >Three

(3) Number of persons living in a house

(i) <5 on 5 (ii) 6-10 (iii) 11-15 (iv) >15

(4) Number of Persons in the interviewed family

(i) <3 or 3 (ii) 4-6 (iii) 7-9 (iv) >9

(3) Family Possessions

(1) Ownership of appliances

(i) Fan (ii) Iron (iii) LPG (iv) Refrigerator (vi) Cooler

(vii) Colour T.V. (viii) Telephone (ix) VCR/VCP (x) Generator (xi) Washing Machine (xii) Geyser (xiii) Air Conditioner (xiv) None

(2) Ownership of vehicles

(i) Bicycle (ii) Moped (iii) Motor cycle (iv) Car/Jeep

(4) Educational, Professional and Migratory Status

(1) Educational Status (i) Educated (ii) Uneducated

(2) If educated level of education

(i) Primary/Middle (ii) High School/Intermediate (iii) Graduate (iv) Post Graduate (v) Doctorate (vi) Others

APPENDIX-I

QUESTIONNAIRE

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(1) Educational Status (i) Educated (ii) Uneducated

(2) If educated level of education

(i) Primary/Middle (ii) High School/Intermediate (iii) Graduate (iv) Post Graduate (v) Doctorate (vi) Others

(3) Profession

(i) Mechanics/Laboourers (ii) Business Men (iii) Students (iv) University Teachers (v) Doctors (vi) Others

(4) Migratory Status

(i) Migrating (ii) Do not migrate

(5) Reasons of migration

(i) Better housing (ii) Better Environment (iii) Employment (iv) Religious

(5) Housing Conditions

(1) Status of the house

(i) Own house (ii) Private rented houses (iii) Govt. houses (iv) Others

(2) Use of the house

(i) Residential only (ii) Residential and industrial (iii) Residential & Commercial (iv) Residential, Industrial & Commercial

(3) Type of the house

(i) Bricks and concrete (ii) Mud/Thached (iii) Wood/Jhuggi (iv) Others

(4) Floor are of the house (in Square feet)

(i) <300 (ii) 300-1,000 (iii) 1,001-2,000 (iv) >2,000

(5) Total number of rooms in the house

(i) 1 (ii) 2-3 (iii) 4-5 (iv) >5

(6) Average area of the rooms (in Square feet)

(i) <100 (ii) 100-200 (iii) 201-300 (iv) >300

(7) Floor Space Per Person in Sleeping rooms (in Square feet)

(i) <10 (ii) 10-20 (iii) 21--30 (iv) >30

(8) Is there Proper ventilation in the house

(i) Proper (ii) Not Proper

(6) Bathroom and Sanitation Conditions

(1) Bathroom and toilet facility in the house.

(i) Present (ii) Not Present

(2) Type of latrine facility

(i) Private (ii) Public (iii) Roadside (iv) Field

(3) Type of Private Latrines

(i) Flush (ii) Manual

(4) Type of Flush Latrines

(i) Septic tank/Municipal Sewer (ii) Open drains

(5) Number of Person sharing one toilet

(i) No sharing (ii) 1-5 (iii) 6-10 (iv) >10

(7) Household water supply

1. Source of water supply

(i) Private
- Own Hand Pump
- Piped water connection
- Own tube well

(ii) Public
- Road side hand pump
- Road side Piped water
- Open well

(2) State of Water Supply

(i) Regular (ii) Not regular

(3) Quality of water supply

(i) Satisfactory (ii) Unsatisfactory

(4) Amount of water supply

(i) Sufficient (ii) Not sufficient

(5) Mode of water storage

(i)In open containers (ii) In closed containers

(8) Sullage and Drainage of Water

1. Disposal of Household waste water

(i) Into the Nali (ii) Around the house (iii) In the house itself

2. Drainage around the house

(i) Exists (ii) Does not exists

3. If exists, type of drainage

(i) Open (ii) Closed

4. Water logging around the house

(i) Yes (ii) No

5. Types of Water logged

(i) Rain water only (ii) Waste water only (iii) Both

(9) Household garbage and Solid waste

1. Mode of storage of household waste inside the house

(i) In open containers (ii) In closed containers(iii) Do not store

2. Mode of disposal of household wastes

(i) Official dumps (ii) Collections points (iii) Road side

(iv) Burn

3. Garbage in the mohalla

(i) Spread everywhere (ii) Not seen

4. If spread everywhere

(i) In huge quantity (ii) In small quantity (iii) Negligible

5. Industrial waste in the Mohalla

(i) Yes (ii) No

6. Garbage collection by the municipality

(i) Collected (ii) Not collected

7. Frequency of garbage collection

(i) Daily (ii) Twice a week (iii) Weekly (iv) Monthly

(10) Household Pests

(1) Insects and Scavengers in the house

(i) Flies (ii) Mosquitoes (iii) Rat/mice (iv) Cockroaches/Crickets (v) All (v) Nothing

(2) Use of fly doors and windows

(i) Yes (ii) No

(3) Various methods used to prevent insects and scavengers inside the house

(i) Pump cans (ii) Aerosol (iii) Mosquito coils (iv) Bed Net (v) Private service (vi) Government service (vii) Nothing

(4) Do you spray your rooms and kitchens?

(i) Use of spray (ii) Do not use spray

(11) Food Contamination

(1) What is the time of eating food after it has been cooked?

(i) At once (ii) After 1-2 hrs. (iii) After 3 hrs.

(2) Mode of storing food

(i) Left in open (ii) Cupboard/food net (iii) Refrigerator

(3) Cooking medium used

(i) Refined (ii) Non-refined

(4) Do you purchase fast food?

(i) From street vendors (ii) From corner shop (iii) Don not purchase

(12) Indoor Air Pollution

(1) Place of cooking food

(i) Separate kitchens (ii) Verandah/multipurpose rooms/open air

(2) Types of fuel used for cooking

(i) Wood Coal/Saw Dust/Dung cake/Dry leaves (ii) Kerosene/electricity(iii) LPG

(3) Do you Smoke Cigarette/Bidi inside the house

(i) Yes (ii) No

(4) If yes, how many per day

(i) <5 (ii) 6-10 (iii) 11-15 (iv) >15

(5) Does smoke come inside the house from outside ?

(i) Yes (ii) No

(6) If yes, sources of out door smoke

(i) Neighbours (ii) Automobiles (iii) Industries (iv) All these three

(7) Exit Capacity of the indoor Smoke

(i) Goes out through Ventilation (ii) No

(13) Indoor Noise Pollution

(1) Noise Pollution in the mohalla

(i) Yes (ii) No

2. If yes! Sources of noise pollution

(i) Household appliances (ii) Automobiles/ Industries (iii) Laud Speakers

(iv) Market/ Railway (v) all

(3) Intensity of noise pollution

(i) Low (ii) Medium (iii) High (iv) very high

(4) Do you face noise Pollution due to religious occasions.

(i) Bhagwati Jagran (ii) Durga Puja (iii) Ram Leela(iv) Deepawali (v) All of these

(5) Do you get disturb with traffic noise while studying?

(i) High (ii) Moderately (iii) Low (iv) Not at all

14. Household Environment and health

(1) Name the four most frequently reported diseases of the family

(i) Pneumonia (ii) Malaria (iii) cough and cold (iv) typhoid (v) jaundice (vi) Asthma (vii) T.B. (viii) Gastroenteritis (ix) skin disease (x) bronchitis

(2) Name the four most important household environmental problems that should be improved.

(i) housing Conditions (ii) Drainage System (iii) Bathroom and Sanitation

(iv) Waterlogging (v) Drinking water (vi) Noise Pollution (vii) Indoor air pollution (viii) Fume and smoke (ix) Garbage and solid waste (x) household pests (xi) none

15. Environmental Awareness

(1) Do you feel that the quality of water food and surrounding environment leads to the various diseases?

(i) Strongly agreed (ii) Agreed (iii) Do not agree (iv) Cannot Say

(2) How will you contribute to improve your household environmental conditions and also the conditions of the Mohall?

(i) Time effort (ii) Money (iii) Both (iv) Nothing